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Installation Engineering

Conclusions from the E.C.A. Paper

WE cannot imagine what led the E.C.A. to describe the symposium presented at its Conference as a "paper." Actually each of its five parts is a paper in itself and merits for individual consideration the time devoted to the discussion of the whole of the symposium, which is a reliable guide to some of the more important branches of installation technique.

We think that two important general conclusions may be drawn from the paper. The first is that electricity, for too long described as being in its infancy, has become so essential in all modern buildings that its installation is now an integral part of the construction. It is no longer treated as an afterthought—a mere matter of running a few conduits and wires where room could be found for them. This way of looking at it has been one of electricity's most severe handicaps. Occupiers of buildings have often hesitated to undergo the inconvenience and expense of having those buildings carved about for the installation of an adequate electrical service and have remained content with lighting alone.

As Major P. A. Smith shows in his section of the paper, an adequate electrical service in a modern building means a great deal of equipment the accommodation of which has to be planned in advance. Moreover, the installation has to be so designed and arranged that alterations and additions can be made with the minimum of disturbance. Hence the development of the underfloor duct system so ably dealt with by Mr. E. Jacobi, which, combined with the air-insulated bar distribution method with which Mr. R. A. Marryat deals, ensures a substantial but adaptable installation.

Safety and Convenience

But an installation must not only be sound and convenient; provision must be made to guard against fire and shock risks. In this direction, too, the paper has much to say. Major Smith makes two suggestions. One is that there might be a reversion to the use of low voltages (not exceeding 100 V), and he considers that contractors might develop the use of transformers on consumers' premises. The other is that the earth wire might be abolished in favour of a concentric form of wiring with the neutral as outer, two-pin non-reversible plugs being employed.

The whole of one section, Mr. T. C. Gilbert's, is devoted to the consideration of safety methods. In our pages and elsewhere Mr. Gilbert has been for years an advocate of the earth leakage trip as a means of surmounting the problems of the high-resistance earth and the failure of continuity which often put an earthing system out of action. In this present paper Mr. Gilbert stresses the fact that the trip must be regarded as a voltage-operated device, and he reveals some of the requirements which the new British Standard Specification for earth-leakage circuit-breakers will lay down.

Convenience is the keynote of the section by Mr. E. A. Reynolds, who acknowledges that much has been accomplished in the way of standardisation of accessories, but points out how much still remains undone. Contractors and the public are still caused a great deal of inconvenience by the multiplicity of sizes and shapes of switches and plugs and sockets. If the position was cleared up not only would these accessories be more convenient to install and use, they might even be cheaper.

High Qualifications Needed

The second of the two conclusions to which we have referred earlier is that electrical "contracting" is an inadequate description of a branch of engineering which requires an ability in planning and execution not inferior to that necessitated by other branches with more dignified titles. It is patent that such work cannot be handed over to anybody who cares to call himself an electrical contractor. A thorough training, both theoretical and practical, is essential, and some means of sorting out the sheep from the goats is even more necessary if men are to be encouraged to fit themselves for the industry.

The possession of degrees or diplomas, or membership of the I.E.E., no doubt helps the public to choose the right man, but the public often wants the cheaper man, and so some form of compulsory registration is advocated. If and when compulsion arrives it seems to us, after reading the paper, that there should be at least two grades: those capable of handling any installation, from the largest institution to the smallest dwelling-house, and a second grade for those whose abilities, though sufficient for the smaller classes of work, are more limited.

E.C.A. Progress

FOR the most part the presidential address and report presented by Mr. Walter Riggs at the E.C.A. Conference was a record of steady, if unspectacular, progress. We consider that one of the most important developments of the year was the reorganisation of the constitution which increased the number of regional boards to eleven. The significance of this is that it gives members a better contact with, and therefore greater interest in, the work of the Association. This should help to kill the apathy of which complaints have not infrequently been heard. Another outstanding piece of work is the "re-zoning" of the country for wages purposes. This is calculated to remove certain existing anomalies and should eventually bring about a more satisfactory position, although there may be some murmurs during the period of adjustment. Details of the new arrangement are given in this issue. Relations with manufacturers have been strengthened during the year, but little progress appears to have been made regarding the regularisation of the position as between contractors and electricity supply authorities. Mr. Riggs considers that the Government should step in where the I.M.E.A. fears to tread.

Connection Diagrams

OVERLOADED final sub-circuits continue to be a menace. How much easier it would be to comply with the provisions of Section 201 of the I.E.E. Regulations if reference could always be made, especially in the event of extensions, to a diagram of connections. Few people have enough knowledge of the subject to make out their own. It should be the duty of the installation contractor to leave behind him on every job a copy of such a diagram in permanent form, showing the sizes of wires and their ampere ratings, which should be kept up to date. To do so should surely be recognised as good practice, and, as such, it is important enough to warrant inclusion in the I.E.E. Wiring Rules. It would also benefit future contractors and the consumers themselves if fuses were labelled with an indication of the circuits which they protect. This would enable the right pair to be withdrawn immediately when work is to be done on a particular point and also save the consumer the trouble of withdrawing each bridge (probably with a match as the sole light) until he finds the right one when a fuse blows.

Research on Metals

JUST as physics provides the raw material for fresh electrical fields, so does metallurgical progress bring new means for the application of electrical science. The electrical industry owes much to the British Non-Ferrous Metals Association on account of its investigations into a range of subjects of such wide diversity as electro-deposition, lead for cable sheathings, alloys for high temperatures and condenser-tube corrosion. Our own industry is, however, doing its share towards facilitating these researches in many ways, as will be evident from the nature of the plant installed in the extended laboratories of the Association which were opened this week. But this is not all. A large proportion of the engineering skill necessary for directing the researches there is provided by men whose names are eminent in the electrical world; while the list of subscribers includes the E.R.A. and many of the leading electrical manufacturers. For electrical engineers generally, an illustration is given of the importance of keeping in touch with developments outside the immediate task if they would keep out of a rut. We hope to describe these laboratories next week.

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Salesmanship

THE necessity for well-trained (and well-paid) sales staffs in the electricity supply industry was one of the points stressed in the report of the McGowan Committee, and it is a point not always appreciated by supply authorities. The Electrical Development Association has done its best to impress upon its members the need for action in this matter and for their assistance has instituted a salesmanship course leading to the award of certificates and diplomas. It is therefore "up to" them to encourage likely members of their staffs to take the course and qualify and, further, to insist on the possession of a certificate or diploma as a necessary qualification of candidates for employment on their sales staffs. Another point worthy of mention in connection with the E.D.A. salesmanship course is that it is not reserved for the employees of members only. It may be worth while for electrical contractors to look into the matter and bring the course to the attention of their salesmen.

Mains in Highways

ABOUT a year ago, as the result of the proceedings in the case of the West Yorkshire Gas Distribution Bill, a Joint Committee of both Houses of Parliament was set up to report upon the apportionment of the cost of breaking-up streets for mains-laying by statutory authorities, and the cost of removing or altering apparatus in the event of road alterations or widenings. The Committee's report has now been published (Stationery Office, 5s. net), and, broadly, its chief recommendation is that the work should be paid for by the authority which initiated it—which will generally be the highway authority, although there are safeguards and provisos. As the matter is of great importance to supply authorities, we propose to publish next week a full consideration of the proposals from a legal correspondent who is well acquainted with the subject.

"Wired Wireless"

IN a letter published in this issue Capt. P. P. Eckersley, whose work on the subject is well known, asks why proper consideration was not given to the use of electric mains for the relaying of radio programmes before the Post Office embarked upon its scheme for using the telephone service for the purpose. A similar letter which appeared in *The Times* last week has called forth support from Mr. W. B. Woodhouse, managing director of the Yorkshire Electric Power Co., and a past-president of the I.E.E. He backs the proposal that a conference of all parties interested from a technical point of view should be called without delay to decide the best course.

Amended

RECENTLY the Portsmouth City Council resolved that its Electricity Department should be consulted before apparatus was installed in Council properties. An interesting illustration of the need for such collaboration is contained in two Council minutes. On April 14th the Passive Air Defence Committee was authorised to proceed with the installation of a gas refrigerator costing £75 in the kitchen larder of St. Mary's Hospital and a gas refrigerator costing £40 19s. in each of four wards. The minutes dated May 25th record the sanction of the Council to a variation of this scheme by the substitution of "electric" for "gas" and "£56" for "£75" in the first case and "electric" for "gas" and "£19 10s." for "£40 19s." in the second case.

THE E.C.A. CONFERENCE

Presidential Address and Paper

On Wednesday about 470 members and friends of the Electrical Contractors' Association and its Allied Organisations assembled at Brighton for the Association's 13th Annual Conference.

In the evening the delegates were received by the President (Mr. Walter Riggs, M.I.E.E.) at the Grand Hotel, and subsequently there was dancing and the presentation of a cabaret.

The business sessions opened at the Royal Pavilion on Thursday morning, when, after a civic welcome by the Mayor of Brighton (Councillor J. Talbot Nanson), Mr. Riggs delivered his presidential address and report for the past year which is reviewed below.

Then followed the presentation and discussion of the conference paper "Advances in Installation Work," the five parts of which are abstracted in subsequent pages. The evening function arranged was a reception by the Mayor.

The proceedings for to-day, Friday, are the Annual General Meeting in the morning and a garden party on the East Lawn of the Royal Pavilion in the afternoon. A smoking concert and dance is to be held at the Grand Hotel in the evening. Next week we propose to publish a report of the discussion and other proceedings, illustrated by pictures taken by our photographer.

Presidential Address

THE president said in his introductory remarks that he was departing from the usual practice of presenting a presidential address and an annual report and combining the two.

Mr. W. Riggs, M.I.E.E., President of the E.C.A. and Allied Associations

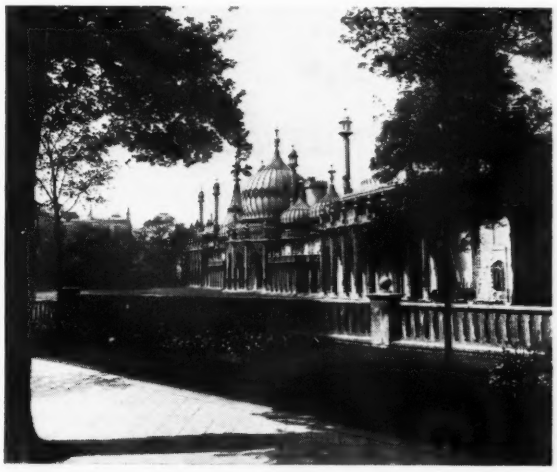
His predecessor had suggested that there was some apathy and lack of loyalty among the membership but he (Mr. Riggs), although not implying that every member was doing all he could thought that the increasing membership—now nearing the 2,000 mark—revealed a general recognition by contractors of their obligations to the electrical industry and to their own section of it particularly.

The reorganisation, involving an increase in the number of sectional boards to eleven, had been the means of giving a larger number of members representation, although the Council had been reduced in number from 50 to 30. The newly instituted regional conferences had proved most successful and he hoped would be more so when members realised what the conferences meant to them.

No finality had been reached in the discussions with the I.M.E.A. (initiated at the request of the Electricity Commissioners). Relations between particular supply undertakings and local contractors varied widely. While individual and personal opinions continued to dominate this field a general national working agreement continued to elude them. The electrical contractor was entitled to reasonable security of tenure and the Government should decide the issue once and for all and give the contractor reasonable protection. All that they asked for was freedom from unfair competition.

In a reference to the National Committee set up to deal with the matter of compulsory registration Mr. Riggs said he wished to dispel the allegation that the E.C.A. supported the Committee from purely selfish motives. It did not wish for a closed industry: membership was open to any contractor who could prove his ability to serve the public adequately. In this direction the Mother Country was behind certain of its Dominions and contractors were urged to proceed with the achievement of this important project.

The Association was represented on a variety of committees in connection with the British Standards Institution and other bodies thus utilising its experience for the furtherance of all efforts to enhance the value and prestige of the industry.



The Royal Pavilion, Brighton, where the meetings are being held

As regarded the Fair Trading Council, the President said that the individualism which existed in the electrical industry (probably no more and no less than in other industries) prevented a quicker achievement of the many ideals which they entertained but progress was being made. More people were adopting the Policy and he believed that eventually it would be accepted by the whole industry as a mandatory document.

Brighton Promenade, looking west

During the last few months a determined attack had

been made on "discount snatchers," but another serious menace was the growth in the number of buying guilds among commercial and civil service staffs. He considered the matter to be one in which Government action was required.

Important reforms had emerged from discussions with the Electric Lamp Manufacturers' Association: the definition of a retailer had been drastically altered; the method concerning the acceptance of retailers and registered users had come under review; and the adjustments which had been made would be of mutual benefit both to manufacturers and contractors. The joint meetings with the Cable Makers' Association had been less spectacular in their importance but had nevertheless served to increase and develop mutual understanding. He was convinced that the achievement of the Fair Trading Policy was only capable of accomplishment by the active co-operation of the various associations of the industry.

He believed in 100 per cent. organisation as a means of rendering better service to the public. He also believed that the time would come when a practical demonstration of inter-association support would be necessary. Members of the N.E.C.T.A. with members of other associations would then have to answer the question of controlled buying which was a vital preliminary to the final stage of operating in their entirety the principles of the Fair Trading Policy.

He testified to the happy relationship existing between the National Federated Electrical Association and the Electrical Trades Union and mentioned the conclusion of the new "zoning" agreement. With regard to the question of national working rules the real object behind the proposal was to avoid the anomalies which had existed between district and district under the varying local working rules. The question of juvenile labour was also receiving attention in an attempt to regulate the entry of casual boys into the industry. These boys could not find permanent employment in the industry and later developed into "cut-price" workmen or incapable master men.

Unconstitutional action had been taken by E.T.U. members in certain directions. He deplored such tactics whether employed by members of the E.C.A. or the E.T.U. Progress in joint negotiations between the two bodies was dependent upon mutual confidence.

With regard to the future the President emphasised that responsibility rested not only upon him, the Council, the Executive Committee and the officials but upon every member of the Association and he called upon members to play their part.

He concluded by thanking all those who had worked for the Association during the past year particularly mentioning Mr. W. H. Walton, chairman of the Executive Committee, Messrs. E. A. Reynolds and A. Smith, vice-presidents, Mr. H. M. Drake, past-president, and Mr. L. C. Penwill, the director and secretary.

Conference Paper

Advances in Installation Practice

(1) Low-voltage Distribution

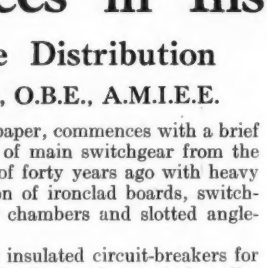
By Major P. A. Smith, O.B.E., A.M.I.E.E.

THIS, the first section of the paper, commences with a brief history of the development of main switchgear from the open-type slate or marble panel of forty years ago with heavy slow-break gear to the production of ironclad boards, switch-fuses and fuse-switches, bus-bar chambers and slotted angle-iron framework.

The introduction of air and oil insulated circuit-breakers for heavy currents has been followed by the development of smaller sizes even down to the final sub-circuit distribution boards. They have the advantage of being easily reset and can be remotely controlled if required.

The "unit" type of board is rapidly becoming standard practice owing to the ease with which alterations and extensions can be made and the way in which it simplifies connecting up. Air-insulated bare conductors can easily be incorporated in this type of switchboard. Other developments of recent years are the line-contact switch and quick-make slow-break switches for use on AC circuits.

High - rupturing - capacity fuses are more rapid in action than the ordinary tinned-copper fuse and can handle greater currents without damage. As regards earthing methods, the author mentions the use of tinned-copper tape for this purpose on main switchgear.



[*Wykeham Studios*

Major P. A. Smith is Chief Engineer and Managing Director of Drake & Gorham, Ltd.

There are three main wiring distribution systems. The "tree" arrangement adopted by the early pioneers is still in common use where demands are heavy and likely to fluctuate considerably. Nowadays air-insulated bar or rod distributor mains are used with various forms of circuit wiring at the tapping-off points; insulated cables, which are also used, are at a disadvantage compared with bare conductors.

Radiating distribution systems with looping-in circuit wiring are arranged so that the whole of the load is taken from one or more intake positions independently, with separate switchgear and distribution boards, to supply circuit wiring arranged on the looping-in system. A similar method is the radiating distribution system with connector circuit wiring, but here the circuit wiring is run through junction boxes to the circuit outlets with connectors intervening. This involves less wiring and reduces voltage drop. The author also mentions the floor duct system which is the subject of the section by Mr. E. Jacobi.

Dealing with wiring conduits, Major Smith mentions the screwed copper type which is comparatively free from condensation troubles. The latter, however, are not so serious as they were on account of the improvement in rubber-insulated wires. The standardisation of these wires and the use of voltage instead of megohm ratings constitute a marked advance and v.i.r. cables have now virtually superseded the "ite" class.

The copper concentric system of wiring has not received the publicity it deserves. In this the outer sheathing is in close contact with the inner insulated wire and acts as the return conductor. As regards other metal-sheathed systems it is considered advisble to have a copper earthing or bonding wire in addition to the sheathing.

Considerable improvements have been made in t.r.s. cables, but in the best class of sunk work it is usual to provide protective tubing. The t.r.s. cable is free from condensation and will stand more knocking about than metal-covered wire.

Reference is made to the mineral insulated cable which can withstand very high temperatures, excessive currents and rough treatment without apparent damage. It is not difficult to install, but there is some difficulty in preparing the ends.

The author considers that the future trend will be towards simplification and the abolition of the earth conductor, as apart from the neutral conductor, under conditions of multiple protected earthing. As the neutral conductor is generally at or near earth potential, the present practice of providing an earth conductor and a third earthing pin on every properly protected plug outlet is at least redundant and imposes an unnecessary expense on the consumer.

An ideal system, so far as earthing is concerned, might be to have a concentric form of wiring with a continuous copper outer, protected against corrosion, either as a sheathing with inner conductor or conductors or, perhaps preferably, in the form of tubing to simplify the drawing-in of the circuit wires. The plug outlets would be of the two-pin non-reversible type.

This would reduce the size of the sheathing or tubing to the minimum as there would be no return wires to consider. There would be no necessity for looping; single-pole switches and fuses only would be needed; and earthed portable apparatus would be safer in use as the earth wire being in common with the neutral would have to remain intact for the apparatus to continue to function.

The author is in favour of a return to a voltage of not more than 100 for private consumers, and suggests that contractors might develop the use of transformers for the purpose, combined with some form of common distributor main for all services in a dwelling house in view of the all-in rates which are now becoming universal.

It is also advocated that supply authorities should balance their systems by means of suitable disconnector boxes on their main distribution instead of imposing the expense upon private consumers.

(2) Air Insulated Conductors

By R. A. Marryat, B.Sc., A.M.I.E.E.

THE modern employment of air-insulated bar conductors for the distribution of electricity in large buildings is a reversion to a practice introduced about sixty years ago in London for distribution from local generating stations. The economic advantages of armoured cables for street distribution work led to their adoption, and the use of bar conductors became limited to special applications.

As loads in large buildings increased, however, the space taken by heavy cables led to the introduction by an E.C.A. member of a rigid-bar distribution system. This reduced the first cost of installing rising mains and economised in space. The conductors were round copper rods, enclosed in micanite tubes, held in position by insulating cleats. Their passage through floors was by way of porcelain tubes, and provision for taking off sub-circuit wiring took the form of bolted clips fitted with cable lugs. This and similar systems have the advantage of adaptability to changes in installations.

[*Rembrandt Studio, Richmond*
Mr. R. A. Marryat is with Marryat & Place, Ltd.

The later development of rectangular and tubular bars has the advantage of increasing the current-carrying capacity on account of the greater cooling surface and meeting "skin effect." In some very large buildings ring mains have been formed of rigid bars, and it is possible to fit links to isolate sections of the system.

An improved form of porcelain insulator has been incorporated in a rectangular bar system patented by an E.C.A. member in 1937. This will not permit the collection of dirt and moisture which might cause a leakage between conductors. The new design retains the efficiency of the pin-type insulator, economises space and reduces protective trunking to the minimum. Rigid support enables these insulators to withstand the severe forces which may be set up between conductors, but the conductors are free to expand and contract in the longitudinal direction.

Trunking both supports the insulators and provides protection for the conductors, and provision is made for fitting special fused sub-circuit tapping boxes at any desired position. The ability of bare conductors to run at high temperatures without fire risk makes it essential to exclude all rubber or other inflammably insulated cables from the trunking; the I.E.E. Regulations require the removal of insulation for a distance of 18 in. from the point of connection and the substitution of heat-resisting insulation where necessary. In the system mentioned separate boxes, which may be fitted with fuses up to 200 A, have been introduced.

In factories distribution systems have been built up from complete units, each comprising a straight length of steel casing containing porcelain-insulator mounted bar conductors. These are arranged to form continuous runs, wth corner, tee and other units fitted at the required positions. Tapping boxes, with fuses, can be inserted at any point in the completed system. Typical factory layouts are illustrated in the paper.

Problems Involved

The author reminds contractors that although the system appears simple great care has to be taken in the design of the various components, for nearly all the problems which confront switchgear manufacturers are involved.

A 40 deg. C. rise in temperature, with an ambient air temperature of 30 deg. C., is allowed by the relevant British Standard Specification, with reductions as the air temperature increases so that a 70 deg. C. maximum is fixed. For bus-bars of over 2,000 A capacity, however, a 50 deg. C. rise, with a maximum temperature of 80 deg. C., is allowed. The method of mounting the bars has a considerable influence upon their temperature and that of the air in the trunking.

In AC systems the voltage drop due to reactance has to be considered when long runs are involved. It may be reduced by employing in the place of one bar four sets of bars of equal capacity and by decreasing the space between bars, having due regard to flashover possibilities. Joint bolts and clamps should be of non-magnetic material.

It is necessary to guard against the heavy short-circuit stresses which may be set up between conductors by providing insulating supports at a sufficient number of points. This is particularly important where two sets of bars are carried in a single trunking. The heating effect of short-circuit currents must also be considered, and in this connection the author mentions the advantage of using h.r.c. fuses.

Joints between lengths of bar should not introduce high resistances, and where they are bolted provision must be made for taking up differences in expansion of the bar and the bolts. Allowance must also be made for possible thermal expansion due to variations in temperature; there are special expansion joints for this purpose.

It is necessary to maintain adequate spacing between the conductors themselves and the conductors and the casing; the possibility of using continuous insulating barriers between conductors is mentioned.

For earthing purposes the sections of casing should be efficiently banded together and it may be necessary to run a separate earth strip throughout the length of the enclosure. Alternatively, earth leakage trips may be employed on each sub-circuit.

The use of aluminium for conductors is considered. Although the specific resistance is higher than that of copper, the larger cross-section required gives greater cooling surface, and the net increase in cross-section need be only 50 per cent. Owing to its ready oxidation aluminium should be well cleaned before jointing and all air should be excluded. As the metal is softer than copper care has to be taken not to crush it under pressure of joint bolts. Other points which have to be considered are the higher thermal coefficient and lower melting point of aluminium.

(3) Duct Systems

By E. Jacobi, A.M.I.E.E.

MODERN building construction methods have considerably reduced the possibilities of cutting and chasing for the installation of electric wiring; hence the need for a duct system incorporated in the building itself.

A well-designed duct system will enable outlets to be installed to suit any working positions and permit the rearrangement of other than ceiling general lighting points; switches and circuits may be provided for ceiling outlet points to suit any division of floor space and any arrangement of multiple tenancies; and additional wiring for new services may be drawn in and new outlets used at any positions at any time.

[*Elliott & Fry.*
Mr. E. Jacobi is with Troughton & Young, Ltd.

The necessity arises from variations in the point of use of the service, in respect of the capacity of the service and the load required, and in the type of service required and the addition of completely new services.

The provision of accommodation for rising ducts is a matter for the architect rather than the engineer. It is feasible to provide risers of sufficient capacity and of the correct nature to allow for any supply that may be needed, but such provision cannot be made in lateral distribution.

Floor constructions may be classified as follows:—Solid concrete, hollow tile and pre-fabricated concrete. The provision of underfloor ducts is assisted by the fact that whatever the nature of the floor structure a covering of screed or floor fill or small wood filler joists has to be employed.

There are many types of duct, but two standard types have been developed—a rectangular metallic pattern and a non-metallic half-round or semi-elliptical pattern. They are both employed under similar general principles: the floor fill is increased to a depth of about 3 in. to accommodate the duct, which is laid over the floor space in the form of a grid.

The distance between lines of ducts varies according to requirements; the ducts should approach the wall at right-angles or parallel to it to within a distance of 3 ft. At angles a junction or draw-in box is fitted, and to prevent different services in different ducts crossing in the box in contact with one another a separator is employed and the box is designed to give metallic separation between different services in their passage through the box.

An adjustable lid, inset with the floor covering material, is held in position by means of adjusting screws to allow for differences in the level of the finished floor.

The wiring run in the ducts may be for medium voltage (lighting and power) and low voltage (telephones, bells and signals). It is usual to install the cables for different classes

of service in separate ducts, and special arrangements have to be made to meet Post Office requirements. Although a three-duct system may be required two sets of ducts for medium- and low-voltage cables usually suffice.

Outlets for general lighting are required in the ceiling of a room and may be taken from the duct in the floor above, but those for other services may be taken upwards from the floor of the room. Conduit runs are provided between the ducts on each floor and those on the next floor up and down. They are installed in the structure—in stanchions or walls and the wiring for any room or set of rooms may thereby be completely self-contained and connected to distributing centres on the same floor.

There are two methods of forming outlets: first, those arranged in the duct and left flush with the floor ready for use, and those made by boring through the floor into the duct. The former should be at not more than 3 ft. centres. A pedestal must be provided to screw into the outlet, and the top of this will accommodate the appropriate socket outlet, jack, &c. When it is possible to use new runs of conduit outlets screwed to standard conduit thread are employed.

Specifications for Ducts

British Standard Specifications Nos. 774 and 815, 1938, cover steel and non-metallic ducts respectively. The former are made in two depths—shallow and deep. The width may vary from 2 to 2½ in. and the capacity from 2 sq. in. to 3¼ sq. in. Non-metallic ducts are made of impregnated fibrous material and are normally half-round or semi-elliptical in section, varying between 1¾ in. and 2¼ in. external radius and between 2½ sq. in. and 6 sq. in. in cross-sectional area. Lengths of stranded wire are run through the ducts for connection to earthing terminals in junction boxes and other metallic components.

A diagram is included in the paper illustrating the various types of duct layout, and it is noted that a duct dead end should never be more than 25 to 30 ft. from a draw-in box. The distance between lines of duct should be such that wherever a desk or working position is placed part of the desk should be over the line of a duct or close to it.

Feeder runs joining branch ducts have to be continued back to the vertical main positions for lighting and power, and for telephones and other low-voltage services respectively. The cross-sectional area of duct allowed at positions in which the wiring is concentrated must be increased, and if necessary a double line of each type of duct provided.

Mr. Jacobi states that the cost of providing a given number of outlets is approximately the same for both conduit and duct systems, but the advantage of the latter is made manifest when additions and alterations are made. The metallic duct system is rather more expensive than the non-metallic system, but is less liable to damage during installation.

(4) Accessories

By E. A. Reynolds, M.A., M.I.E.E.

IN the early days of installation work individual manufacturers each produced their own kinds of accessories without fully understanding the needs of the electrical contractor. To-day there is a large amount of standardisation and contractors should specify standard types and eliminate the many non-standard accessories which are still manufactured. The I.E.E. Wiring Regulations have also had a considerable influence on design.

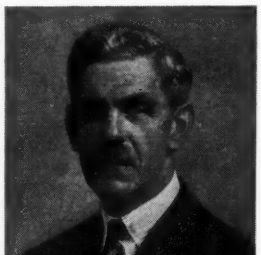
Bakelite, which has been developed in the last few years, has advantages as a substitute for metal, particularly in bathrooms, but its insulating properties are inferior to those of porcelain and it is subject to "tracking."

Designers of switches have not yet fully appreciated the difference between DC and AC operation. The author says that the idea of a quick-break for AC switches was wrong; one or two manufacturers have realised this and have produced slow short-break patterns which prevent the formation of an arc. These also have the advantage of being almost silent in action.

Flexible cords in lighting points are now subjected to excessive heating and as a result of investigation the C.M.A. has produced special flexibles for use with high-wattage and discharge-type lamps. Some makers of industrial fititngs have surmounted the trouble by incorporating a special connecting chamber in their designs.

The use of high-rupturing-capacity fuses has been necessitated by the large increase in the capacity of generated energy behind the distribution mains. While they are essential for protecting consumers' installations, it does not follow that they are necessary for all sub-circuits. In fact, when so used their quicker operation may cause inconvenience. This same property has caused considerable trouble when the fuses have been used as house-service fuses as a fault may blow the main fuse instead of that controlling the faulty sub-circuit only.

The chaotic position of plugs and sockets has been considerably improved by the manufacturers' closer observance of the I.E.E. Rules and the Standard Specification, but there are many patterns claimed to have the dimensions given in the Specification which are not completely in accordance with it.



[*Lafayette*

Mr. E. A. Reynolds is principal in the firm of Reynolds & Bradwell

The existence of three separate sizes of outlets for different purposes presents difficulty to the user. This has been partly surmounted by the use of fused adaptors which have now been included in the B.S.S. for plugs and sockets.

The introduction of solid concrete floors has necessitated the installation of conduit boxes let in flush with the ceiling of the floor below. The B.S.S. has been for malleable-iron boxes only, but a new Specification provides for cast-iron boxes and there are also boxes of pressed steel on the market. Copper alloy boxes of standard dimensions can be obtained for copper conduit systems.

Thermostats for the control of heating apparatus are now very reliable and efficient and have a wide field of application.

The Manufacturers' Position

Among the several associations of electrical manufacturers, only two have had sufficient control of their members to be able to restrict them to definite standard types—the cable and lamp manufacturers' organisations. Thus the C.M.A. has discontinued the manufacture of one of two types of cable after experience and research had shown the superiority of the newer type. Such a policy would be of great advantage to the manufacturers and users of switches of which there are too many patterns, particularly in the case of sunk switches fitted in iron boxes.

The rational tendency in the future should be towards British Standard Specifications for every article in general use and for manufacturers to concentrate on these types and gradually eliminate others. The responsibility for attaining this ideal condition rests almost entirely upon contractors and supply authorities, for manufacturers contend that the multiplicity of types is due to the varied requirements of individuals.

If the various sections of the industry would agree among themselves what are the most suitable types and forms of accessories to adopt as standards, many of the existing patterns could be abolished, and this would enable manufacturers to reduce their prices appreciably.

(5) Earthing

By T. C. Gilbert, A.M.I.E.E.

WHILE his fellow authors are able to report progress in the branches with which they deal, Mr. Gilbert says that he is at a disadvantage for he is unable to point to any considerable advance in earthing practice during the last fifty years.

He contends that the minimum advances necessary to enable earthing to approach the level of efficiency of pure installation work nowadays would be the complete independence of the circuit fuses, or circuit-breakers, whose function is not leakage protection; the complete independence of water supply systems or underground cables as electrodes; the complete control of leakage *voltages* which alone represent danger to the user; a limit to the extent to which uncontrolled leakage voltages may be extended through an installation; provision for easily and quickly testing earth circuits under working conditions; and economy by eliminating earth circuits for heavy currents.

The use of overload protective devices as leakage protection is deprecated for it has been shown that even well-constructed earth circuits can be put out of action and cannot be adequately tested. The risks are added to as the utilisation currents grow larger year by year and the difficulty of providing suitable earth electrodes.

The weaknesses of the method have been shown up in the extension of electricity supply to rural areas, and as a consequence the voltage-operated earth leakage breaker was introduced—with marked success, in spite of the inadequate devices provided by some of our manufacturers.

The current-operated leakage circuit-breaker has been used for some years in this country for heavy currents, but it is

subject to many of the normal disadvantages of earthing. Erroneous views of the proper sphere of usage of the voltage-operated earth leakage circuit-breaker have been due no doubt to the way in which the tenth edition of the I.E.E. Regulations deals with it, referring to the operating current. This has led to the introduction of devices completely unsuited to the duty required, which is the limitation of leakage *voltages* to a safe value. The position will, however, be rectified in the eleventh edition, where voltage is stated to be the criterion of operation. The maximum voltage of operation with an electrode resistance of 200 ohms will be given as 24 V in the new (unpublished) British Standard Specification for earth leakage circuit-breakers, and with 500 ohms 40 V.

[*Elliott & Fry.*

Mr. T. C. Gilbert is principal of T. C. Gilbert & Co., Ltd.

Facility of checking is as important a feature of protective circuit-breakers as their ability to operate with safety against high electrode resistances. In the standard diagram which will be included in the new Specification the earth circuit from the device to the electrode may be immediately checked by pressing the test button and all that is required for checking the complete circuit from the point of usage is a short length of insulated wire to short over the phase to earth.

Under modern conditions one ohm resistance in the earthing circuit, or even less, may render the system ineffective, and apart from risk of shock or fire may lead to extensive damage to plant.

Again, leakage currents cannot be confined to their intended paths, and there may be considerable current flow from conduits to other, non-electrical, conductors leading to the indiscriminate extension of uncontrolled leakage potentials to other parts of an installation. Therefore when earth leakage circuit-breakers are used a separate earth electrode must be installed for them. Only one is necessary if there are more than one breaker; a lightly insulated wire should be run to the earth terminals of all the breakers used and carried back to the supplementary electrode. The author explains and illustrates this method.

The new system operates by allowing the leakage current to pass where it will, and in passing to produce a potential upon the conduits, etc. When this reaches the determined magnitude the breaker will isolate the circuit. Many false contacts may exist between the conduits and non-electrical metal, but these are essentially of low current carrying capacity and the passage of a very few amperes will ensure sufficient voltage rise to operate the earth leakage circuit-breakers. Should, however, the accidental contacts be able to carry the full leakage current without causing a rise of voltage in the conduits, to 20 or 15 V according to the electrode resistance, the circuit may be isolated by means of the fuses. In any event, therefore, the voltage rise is limited to 20 V at most.

The author next deals with methods of confining leakage potentials to predetermined sections of the earth circuit, and shows by diagram how this is accomplished in voltage-controlled systems—in a heated water-pumping system by means of insulating sections in the pipes and in a factory motor circuit by the use of an insulated junction box or t.r.s. connecting tails in place of flexible conduit for taking the leads to the motor.

It has been found that the most efficient way to reduce or eliminate interference with radio is to introduce an inductor in the earth lead, but any intentional increase in the impedance of earth circuits is dangerous. The earth leakage circuit-breaker already possesses an efficient inductor in the shape of its trip coil. This has a bearing in the comparison of costs.

In conclusion, the author emphasises the fact that the installation and operation of earth leakage circuit-breakers is not costly or complicated. He urges contractors to see that devices which they purchase conform strictly to the new Standard Specification which is expected to be published very shortly.

Wages in the Contracting Industry

New Zoning Agreement

HITHERTO, for the purpose of wage payments in the electrical contracting industry, England, Wales, and Northern Ireland have been divided up betweeen four grades—A, B, C, and D. The payments in these grades are calculated on basic rates originally fixed in 1919, and modified in August, 1935. As modified these basic rates were as follows: A, 1s. 6½d. per hour (including travelling allowance); B, 1s. 4½d. per hour; C, 1s. 3d. per hour; and D, 1s. 1¾d. per hour.

These rates are subject to variation according to the rise or fall in the Ministry of Labour's cost-of-living figures, and the current rates are: A, 1s. 9¾d.; B, 1s. 7¾d.; C, 1s. 6½d.; and D, 1s. 5½d.

As a result of negotiations between the National Federated Electrical Association and the Electrical Trades Union it has been agreed that as from the second pay-day in October next (for the period covered by that pay-day) a new system of grading shall come into force.

It was further agreed that both parties should inquire as to the rates of wages generally established in Lancashire and certain other parts of the country included in the new Grade "B2" and the N.F.E.A. agrees that where Grade "B" rates have been generally in operation in such districts for a substantial period of time such towns and districts shall be raised to Grade "B" and shall be scheduled accordingly.

The operation of the agreement is to be subject to the provisions of the National Standardised Wages Agreement (wages variation) dated August 2nd, 1935, the basic rate of Grade "B2" being agreed as 1s. 3¾d. per hour.

The new arrangement is as follows:—

Grade "A."—London—a radius of twelve miles from Charing Cross.

Grade "B."—Mersey District including Birkenhead, Chester, Runcorn, Wallasey, Widnes and all towns and districts in Cheshire within a radius of twenty miles measured from Mold, Flintshire, and that part of Flintshire north of the River Dee.

Manchester, Ashton, Atherton, Blackburn, Blackpool, Bolton, Bury, Crewe, Dukinfield, Fleetwood, Hyde, Irlam, Leigh, Northwich, Oldham, Preston, Rochdale, Southport, Stockport, Warrington, Wigan.

The counties of Monmouthshire and Glamorganshire and the town of Llanelly.

Tyneside, Darlington, Hartlepools, Middlesbrough, Stockton-on-Tees, Sunderland.

West Riding of Yorkshire, Hull, Sheffield.

Birmingham, Coventry, Sutton Coldfield, Walsall, Wolverhampton.

Bristol and the district surrounding it starting at Avonmouth, thence follow coast line to Severn Beach, thence straight across to Pilning, and following around to Patchway, Winterbourne, Downend, Mangotsfield, Warmley, Bitton, Keynsham, Whitchurch, Dundry, Barrow Gurney, Flax Bourton, Failand, Portbury and Portishead to the coast. Places named to be included.

Grade "B2."—Northern Ireland.

The following counties except such towns and districts as are specifically included in Grade "B." Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Cheshire, Cumberland, Derbyshire, Durham, Essex (outside London), Hertfordshire (outside London), Huntingdonshire, Lancashire, Leicestershire, Lincolnshire, Middlesex (outside London), Norfolk, Northamptonshire, Northumberland, Nottinghamshire, Oxfordshire, Rutland, Staffordshire, Suffolk, Warwickshire, Westmorland, North and East Ridings of Yorkshire. * That part of Kent (outside London), north of a line drawn from Woldingham (Surrey), to Sittingbourne on the east. * That part of Surrey (outside London) north of a straight line drawn from Sandhurst in the west to Woldingham in the east. * That part of Worcestershire north of a straight line drawn from the county boundary at Far Forest on the west to Astwood Bank on the east and including Stourport. * (Including the places named).

Grade "C."—The whole of Wales with the exception of that part of the country specifically included in Grade "B." The Counties of Cornwall, Devonshire, Dorset, Gloucestershire, Hampshire, Herefordshire, Kent (except such areas as are included in Grades "A" and "B2" above) Shropshire, Somersetshire (excluding Bristol and district as defined under Grade "B" above), Surrey (except such areas as are included in Grades "A" and "B2" above), Sussex, Wiltshire, Worcestershire (except that part defined above in "B2"), Isle of Man, Isle of Sheppey.

It is not intended to vary the gradings agreed upon pending a review as to the working of this agreement (if such review shall be requested by either party) to take place at the March, 1941, meeting of the National Joint Industrial Council for the Electrical Contracting Industry.

"Roadway Reason"

British Insulated Cables, Ltd., has published a booklet entitled "Roadway Reason," which consists of numerous hints on how to avoid accidents. It contains reminders of some of the less frequent situations which may arise, some of which are possibly outside the scope of the Highway Code.

WHY NOT GET TOGETHER?

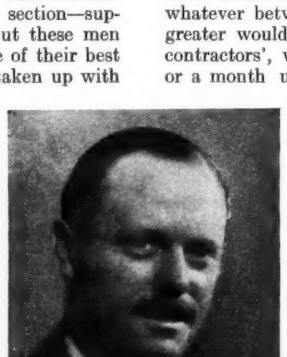
By H. M. Drake, B.A.

The author maintains, as did Mr. Hoadley of Maidstone in our June 9th issue, that it is possible for municipal electricity supply authorities and electrical contractors to work in harmony in pursuit of their common aim—the building-up of electrical load.

DURING the last few years that useful word "co-operation" has been called upon to such an extent in the electrical industry that now it is generally greeted either with ridicule or abuse when mentioned in public. This, though natural, is unfortunate, first because there are many districts where it is already practised, and secondly, because the word has so often been used by all sections of the industry and in every case with apparent sincerity. Had this sincerity been real rather than apparent, better results would have been obtained, and the general condition of the electrical industry would be more flourishing throughout the country than it is to-day.

To say, however, that no improvement has been made in the last few years would be completely untrue. An increasing number of supply authorities are following the example of the favoured districts where contractors and supply pull together for the common good, and there is no doubt that where this example has been followed the public has generally been better served.

The electrical industry is blessed with leaders with the best brains in the country distributed through every section—supply, manufacture, wholesale and contracting—but these men are not at the present time in a position to give of their best to the public because so much of their time is taken up with unproductive internal squabbles. If all their energies could be co-ordinated into a common policy, electrical development would proceed even faster than hitherto. It will be agreed that the aims of the electrical industry are to give the public proper service whilst extending the uses of electricity as rapidly as possible, and it ought not to be beyond the wit of man to see that everyone concerned is playing his or her part without overlapping and causing confusion.



[*Whitlock.*

Mr. H. M. Drake is a past-president of the E.C.A.

In order to arrive at this state of affairs, the sphere of influence of all sections, particularly contractors and supply authorities, should be laid down. The primary duty of the supply authority is obviously to provide a supply of electricity at economic rates as widely as possible, and the sphere of the contractor is to deal direct with the public and develop the load for the supply authority. In order to make sure that this is carried out satisfactorily, it is essential that all installations shall be serviced quickly and efficiently and that periodical tests shall be carried out to maintain the necessary standard of safety and efficiency, and contractors must be organised to give this service.

At present there is no recognised standard of workmanship and this in itself leads to many arguments; true, the Institution of Electrical Engineers has laid down in its Regulations for the Electrical Equipment of Buildings a standard to which consulting engineers subscribe, and in accordance with which nearly all large contracts are designed, but a vast amount of work is carried out to a standard considerably below what it called for by these regulations. If it is considered by the majority of those capable of forming an opinion that the regulations are too stringent, then some other code should be devised, but if they are recognised as being reasonable, steps should be taken to see that they are adopted universally or, alternatively, a minimum code necessary for essential safety should be laid down.

At present certain supply authorities are apt to encourage the "curbstoner" who is a menace not only to the public but to the industry which he disgraces, because although he completes a so-called installation at low prices and thereby provides a rapid increase of load for the authority, such an installation is a perpetual source of irritation and danger to the public. Such tactics are shortsighted and can only lead to disillusion in the long run and a general holding up of real progress.

Much of the trouble which is caused is due to cheap inexperienced and incompetent labour, but there is in the contracting industry an energetic National Joint Industrial Council which regulates the conditions of employment and the wages payable in every district in the country, and it is difficult to understand why it is that these wages, which are nationally agreed, are not adhered to even by some of the larger undertakings. It is to be hoped that the registration of all operatives will become an accomplished fact in the not far distant future and ensure, first, that sound workmanship will be universal, and, secondly, that fair wages will be paid to all operatives; for upon them much of the success of the industry depends.

It is easy to criticise, not so easy to be constructive, but it may be of assistance to suggest that in districts where it is not already a *fait accompli* an active liaison committee consisting of members representing the interests of both supply and contractors should be appointed to discuss all outstanding problems and make joint recommendations on all relevant subjects. They could perform many useful functions, including the co-ordination of publicity efforts in the district.

Under present conditions it is far too common to visit a small town with half a dozen showrooms and to find no cohesion whatever between displays in those showrooms. How much greater would be the effect if all showrooms, municipal and contractors', would concentrate for a given period of a week or a month upon one particular item, taking each of the important domestic appliances in turn. This would not preclude supplementary displays of specialised articles for which individual contractors might have agencies, but even so there is no doubt that the cumulative effect of such publicity would be far greater than is at present the case in most areas. Healthy competition would continue, but this naturally pre-supposes that the Fair Trading Policy is strictly adhered to in every detail.

The question of showrooms naturally leads to the consideration of hire and hire-purchase trading. It is appreciated that there may be some case for simple hire terms to be granted for certain specific current-consuming devices, but many supply authorities have found that there are objections to this method of trading and there is no doubt that it is unattractive unless offered at uncommercial rates, and therefore fundamentally unsound.

Hire-purchase on a satisfactory commercial basis coupled with good salesmanship is fully capable of encouraging the development of the electrical load to the full extent.

Supply authorities are naturally concerned with the increase of load and this should also be the aim of all contractors, but sometimes a shortsighted policy is adopted by both of the parties.

This is particularly true of country districts where private plants have been operating for some years. On the one hand contractors who naturally do not want to lose touch with their own customers are far too apt to recommend that the private plant should be retained even when it would be to the advantage of the customer to transfer his installation to public supply, and on the other hand, supply authorities are far too apt to recommend owners of country houses to scrap their plants and go on the mains, when it would be far more economical for them to retain their plants, at any rate for the time being.

There should be no clash whatever on this issue between contractors and the supply authorities. Both employ trained engineers who from the data available should come to the same conclusion as to the advice to be given. In too many cases the contractor recommends one thing, the supply authority the reverse, and the customer is bound to form the opinion that each side is trying to feather its own nest and a feeling of suspicion is engendered which must adversely affect the development of electricity.

It is impossible to lay down the law and every case must be considered separately. It is after all a simple calculation, allowance being made in the case of private plants for interest

PURCHASER AND CONTRACTOR

Necessity for Co-ordination

By Libra

THE writer of this article has had 20 years' experience as purchaser's engineer, consultant and contractor. He therefore claims to be able to review the question of the relations and co-operation between purchaser and contractor without undue bias.

The successful completion of a contract for construction work is an objective which can only be reached by means of the closest team work on the part of all concerned. It involves, not merely the greatest care and thought in drawing up specifications, conditions of contract, plans and tenders, but also a thorough knowledge of, and understanding of, the points of view of the various parties concerned in the contract.

To begin with the purchaser's side of the matter: his requirements are, or should be, in the hands of *one* engineer of wide knowledge and experience by whom (with the assistance of his staff) all details are settled and all decisions given.

There are few things more productive of chaos, friction, disputes and delays than to have "too many cooks at the broth" at the initial (or, indeed, at any subsequent) stage of the proceedings. In the multitude of councillors there *may* be wisdom; there most certainly *is* delay and confusion.

It is too often forgotten that specifications, plans and conditions of contract are legal documents, all forming part of one legal transaction, namely, the undertaking by a contractor to perform certain things in consideration of certain payments. Yet, how much and how often does the purchaser's engineer suffer from the vagueness and conflicting details of plans and specifications obviously drawn up by people who, while no doubt very capable, have little or no knowledge of law and do not realise the importance of clarity. The ideal condition is found when the entire contract is handled, on the purchaser's side, by one engineer (with his team of assistants) who not only draws up the specifications and plans, but also supervises the whole of the work and passes the final bills.

The Consultant's Part

The importance of the consultant in this connection is not sufficiently widely realised. How often do we see such highly technical matters as electrical contracts handled by architects, surveyors or accountants who, though no doubt first-class experts in their own lines, are not truly qualified to act in such matters. Worse still, we sometimes find contractors acting as their own consultants when the client is a layman with no knowledge of technical matters. Let there be no misunderstanding over this. There are very many contractors whose knowledge and experience is of the first rank, and who are invariably most helpful; and, in all probability, they themselves would be the first to agree with the foregoing, while regretting the fact that competition has forced them to assume the consultant's mantle.

Conditions of contract are, to a great extent, standardised nowadays. It does not by any means follow that they work perfectly in practice, but standardisation has at any rate the advantages that both purchaser and contractor know the conditions from long familiarity, and that time is saved in drawing up contract documents.

Specifications for constructional work can never be standardised. In fact, in his whole experience, the writer cannot recall any two schemes which were exactly similar to one another. There is a certain advantage in drawing up one specification which can apply, say, to the wiring of a certain type of building, but this has only a limited application and, in practice, such specifications are constantly being modified in the light of experience.

In drawing up specifications and plans the most important point is to have in mind, constantly, the human element. This falls roughly into four divisions: (a) the purchaser's office staff, who will be constantly referring to the documents; (b) the purchaser's supervisory staff on site, who want something which not only is, but will remain, easily legible and easily understood; (c) the contractor's engineering staff, who not only have to prepare the tender but also to instruct their men what to do; and (d) the contractor's foremen and workmen. Especially should the last be borne in mind, and for this reason the greatest simplicity and clarity are absolutely essential.

Drawing Office and Works

In many, perhaps in most, cases, the draughtsman who prepares a working drawing on which tenders are to be invited has been for years an expert draughtsman, but has never been in close contact with the actual foremen, fitters, wiremen, &c., who carry out the work. This is a very unfortunate state of affairs, and sometimes leads to queries, disputes and delays which waste the time of the engineer in charge of the construction work. Whenever it can possibly be arranged, joint conferences should be held between the supervising engineers and the drawing office staff, and the latter should be taken to visit the construction work at least once. This matter is of far greater importance than might at first sight appear, for this reason: the successful tenderer has tendered on certain plans which, if not prepared with an intimate knowledge of conditions on site, do not represent the true facts of the job as actually to be carried out. Hence, conditions may, and in actual practice almost invariably do, arise, which are not covered by the contractor's quotation. There is hardly any greater source of delay and waste of time.

In drawing up a specification, windy verbiage and empty phrases must be avoided. The writer recollects seeing specifications nine-tenths of which could have cut out, as consisting of long and quite unnecessary descriptions of how certain items were to be manufactured—all of which could have been covered by simple reference to various B.S.S. On the other hand, vagueness must be avoided, *e.g.*, such phrases as "the usual," "of best quality," &c. One very important item is to specify exactly who performs various items of work—for instance, installation of cable-tails and connecting them up, an item over which confusion often arises and which is very often overlooked when letting different contracts for external cabling and for internal wiring. Another and correlative point is to make sure that certain items are not duplicated in the contracts of two different contractors on the same site.

A great deal of subsequent trouble is saved by making certain that all details in plans and specifications have been given adequate and *final* consideration before issuing these documents for tender. Although it is always possible to admit minor improvements, there is nothing more irritating to the staff on site (both purchaser's staff and contractor's staff) than a series of alterations—revised plans, amendments to specifications, and the like. Nor is there anything which is, in the

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Why Not Get Together? *(Continued from preceding page)*

and depreciation (which should be based in considering the question of change-over on realisation value), maintenance, fuel and lubricating oil, and in some cases supervision. The cost of a mains supply must take into account interest upon all capital entailed in the change-over, including any contribution to the cost of mains extension, alterations to the installation, and cost of exchanging lamps. Such questions need discussion between the supply authority and the contractor concerned but the committee would pave the way and lead to confidence in the integrity of both sides.

The liaison committee could also deal with the question of satisfactory load building. The supply authority could make known its views as to what type of load was required to fit in with its load curve, and contractors in return could give their opinion as to the public feeling with regard to such load. Such points as adequate service facilities, maintenance, and testing could be reviewed, and other technical items such as service charges, balancing and so on would be items for consideration on the agenda.

There is no doubt that in some areas the insistence on a balanced load in comparatively small installations adds greatly to the cost of wiring if the regulations are strictly observed (as they are by reputable contractors) and two-way switching and other problems tend to make the installation less convenient when completed than would be the case if house could be balanced against house, except in the case of really large installations which would have to be dealt with on their merits.

It is difficult to be brief, for the subject is a large one and much has been written by protagonists on both sides, but a little goodwill and commonsense should be able to overcome most of the outstanding difficulties which when reviewed dispassionately appear to spring more from prejudice than reality.

long run, more expensive. Every alteration means an "extra," and every "extra" means a discussion, if not a dispute. Designers seldom appreciate this. It is one of the main causes of that distressing gap which is so commonly observed between estimated cost and final cost.

This leads us to a vitally important point. The name and address of the individual who has the purchaser's authority to settle questions in dispute must always be communicated to the contractor. Where very large contracts, with multitudinous personnel, are concerned, this is essential. The writer has known many cases where months of discussion over final settlements could have been avoided by taking this simple precaution.

In inviting tenders, the purchaser's engineer will naturally select those contractors whose reputation is high and who have done good work for him. Most unfortunately, the selection of contractors to be invited does not always lie in the engineer's hands, and he may, and sometimes does, find himself let in for administering the progress of a contract carried out by contractors whose experience and equipment are unsuitable. He may never have had the opportunity of reviewing the tenders.

Scrutinising Tenders

Assuming, however, that the tenders are reviewed by the engineer who draws up the specifications (which ought always to be the case) and also by the engineer who will supervise the work (this is also very desirable), the first consideration is usually price. The lowest tender is by no means invariably the best. The tenderer may never have read the specification or looked at the plans; he may have filled in a bill of quantities and succeeded in obtaining the contract on that alone. Too much care cannot be given to the scrutiny of tenders, especially for electrical work; and a properly considered decision can only be given by an engineer of long and wide experience who has personal knowledge and experience of works previously carried out by all the tenderers. The variation of prices submitted by contractors of high standing, as tenders based on properly drawn up specifications, plans and schedules of quantities, is very small indeed.

From the contractor's point of view, the preparation of a tender is an undertaking demanding care and experience. He has first to consider the "personal equation" of the particular purchaser concerned. He knows exactly what to put forward in order to make a thoroughly satisfactory and first-class job; but he also knows that his quotation would thereby probably be rendered so high as to ensure the loss of the order, especially if he has reason to believe that he is in competition with others who will put in a "cut price" and hope to "get home on the extras." The field is, fortunately, wide; and the contractor is usually able to decide from his personal knowledge just for what contracts it is worth while to tender.

Everything that has been said as regards care and thought in the preparation of specifications and plans, from the purchaser's point of view, also applies from the contractor's point of view. If these documents have been properly drawn up, the contractor's task is simplified by an inspection of the site (yet how many actually do this?), followed by the calculation of the quotations. If they have not been properly drawn up, the unfortunate contractor has either to enter into a long discussion as to the exact meaning of various items or to submit a tender which is in fact a pure gamble. The best class of purchaser's engineer and the best class of contractor invariably do mutually prefer to agree on the exact interpretation of any doubtful points before a tender is submitted.

On acceptance of a tender the first step should invariably be a conference between the purchaser's engineer and the contractor's engineer held, if possible, on site. At this conference can be settled the exact procedure, the sequence of various events, probable dates of delivery, the probable dates of completion of various sections and of the whole contract and the exact materials, fittings, &c., to be used. The class of contractor who can be relied on to carry out a really good job always welcomes and usually asks for such a conference. With such a contractor the work of the purchaser's engineer (who usually has many contracts to deal with) is reduced to a preliminary conference, one or two inspections, and the passing of a final bill. He knows he will get a good job and that everything specified will be more than complied with. He will never fail to invite that contractor to tender.

Would that such were always the case! How often does he have to ask the contractor to read specifications, look at plans, and to submit samples of materials and fittings before proceeding On the other hand, the contractor suffers considerably from lack of decision on the part of the purchaser. The latter often forgets that the contractor has to place his orders for materials considerably in advance of actual requirements, and has to keep his men employed or he will probably lose the best of them. Thus, an alteration in the type of some item to be used, or in the continuity of a building programme, may introduce a state of affairs where the contractor is entitled to special consideration.

In the actual execution of the contract the most important factor is the efficiency of the personnel on site and the degree of co-operation (or the reverse) existing between the purchaser's supervisory staff and the contractor's agent or foremen. Of all this personnel, the writer would place foremost the contractor's foremen. They can absolutely make or mar a job. Some take infinite trouble to find out the exact requirements of the purchaser's engineer, others will go their own way; but without team work there can be no good work. The best type of man is the finest advertising agent his firm could have.

Discussion and Co-ordination

It is the joint responsibility of the purchaser's and contractor's engineers to see that preliminaries are properly settled before any work is actually put in hand. Thus, in addition to the preliminary conference, they will jointly superintend and inspect the marking-out of the work. At this stage the question of co-operation between different trades invariably arises, and it is necessary so to co-ordinate the efforts of all without friction, overlapping, or the dismantling of the work of one trade because proper consideration has not been given to the requirements of another.

Of the importance of financial control during the progress of a contract, volumes could be written. Any trouble over this matter is usually due to (a) failure to specify exactly the official who has power to deal with such matters, (b) the practice of putting in hand extras or alterations without immediate confirmation in writing, countersigned by the said official, and (c) the practice of introducing extensive alterations or extra work at all.

In a brief article it is not possible to do more than touch upon numerous matters on which a lengthy book could be written. Many of the points mentioned may seem to the reader to be almost childishly elementary. Yet, time after time and year after year one continues to come across the same errors; and it is only by the most meticulous care and by zealous team-work that they can be avoided.

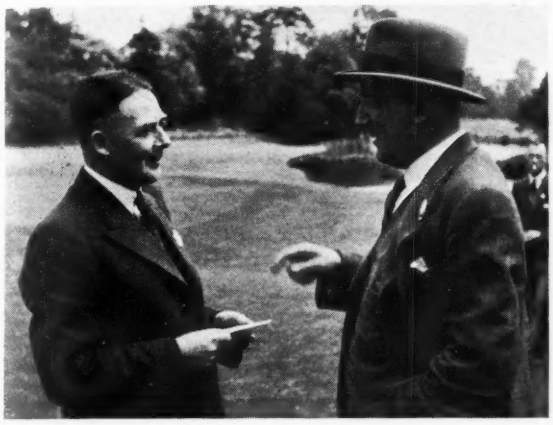
The G.E.C. travellers recently had a trip up the Thames from Marlow to Reading in the launch "Grand Duchess." They were guests of Lord Hirst at Foxhill for tea

MINING ELECTRICAL ENGINEERS

Annual Convention at Sheffield

THERE can be few organisations which have brought the combination of business with pleasure to such a fine art in the matter of annual conventions as the Association of Mining Electrical Engineers. At last week's four-day function, which was organised by the Yorkshire South-East Branch, no mention of "business" was made until the last day, yet such was the programme of works visits and social events that by then the five hundred delegates must have found that they knew a good deal more about mines, their equipment, and their products than they did before.

Most of the delegates travelled to Sheffield on Tuesday,



Captain I. Macintosh, president of the Yorkshire South-East Branch, and Mr. D. H. Williams, president of the Association for 1939-40

calling in at the headquarters of the Convention at the Royal Victoria Hotel to register. In the afternoon about forty of the earlier arrivals took part in a golf competition for the Heyes Cup, held on the Firbeck Hall course, and, in spite of the recent intensive practice by the Yorkshire members, both the winner and the runner-up again hailed from Scotland. They were Messrs. R. Russell and R. White, both of the West Scotland Branch, the latter receiving a cocktail set. Third and fourth were Messrs. D. C. Johnston (London) and T. J. Paterson (Yorkshire). There was an informal reception at the Royal Victoria Hotel in the evening.

At the invitation of the English Electric Co., Ltd., the whole of Wednesday was taken up by a visit to the company's Stafford Works, a special train on which lunch and tea were served conveying the delegates to and from the factory. On arrival at Stafford they were welcomed by Mr. C. Hollander, commercial manager. The President, Mr. H. A. McGuffie, replied, and said that it was up to engineers to say what they wanted in the mines; the English Electric Co. was in a position to supply anything within reason.

The first part of the works inspected was the new high-voltage testing laboratories.

In position for the official photograph at Firbeck Hall

There will be an official opening of these shortly, so until then we promised not to give away any of the "secrets." Passing through the office section the visitors spent three hours touring the various shops where motors, generators, transformers, switchgear and meters are made. Nearing completion was the largest motor on hand at the moment, a 7,000-HP (20,000-HP peak) unit weighing 94 tons for a blooming mill at Broken Hill. Perhaps more impressive still were the various components of the 16,667-kVA generators for the Waitaki hydro-electric scheme, New Zealand, in various stages of construction. The rotors, incidentally, are so big that they have to be made in two halves and wound on site.

Three 37,500-kVA, 3,000-RPM generators for Bolton, Stourport and the Mersey Power Co.; commutators for large winding motors for Roodepoort; and a crankshaft for the largest Diesel engine made by the company were other items to be seen "on the stocks" in the motor and generator section, and a completed exciter for a 40,000-kW alternator for Ferrybridge was the subject of a weight-guessing competition open to the ladies. The winners of the prizes (a table cooker, 2-kW reflector fires and an iron) were Mrs. D. Kingsbury, Miss Rita Martin, Mrs. E. M. Scarle, and Mrs. Arthur Dixon.

In the transformer department the company is being kept busy supplying equipment to the Central Electricity Board for A.R.P. work, and the visitors were shown two 20,000-kVA units, one of which had separate cooling. There were also being made 15,000-kVA transformers for the Victoria Falls Power Co. and Cardiff. In the domestic meter-making section it seemed, from the conversation, that delegates showed more interest in trying to learn how the instruments could be made to stop rather than go. Among the apparatus being made in the switchgear section was a large panel for Broken Hill. Enlightened, but somewhat footsore, the delegates arrived back at Sheffield at about 8 p.m.

A Visit to Hadfield's Works

Another visit was arranged for Thursday morning. This was to Messrs. Hadfield's East Hecla Steel Works, where Mr. A. R. Roebuck, the works director, welcomed the visitors. Replying, the President declared that 75 per cent. of the work of the mines was dependent on special steels. The foundry, visited first, is one of the largest in the world, and is about a quarter of a mile long. Adjoining it a new core shop is being erected.

The works have a maximum demand of 16,000 kVA, and among the electrical apparatus inspected were four "Efco" high-frequency induction furnaces of 2 cwt., ¼, 1, and 2 tons, operated from a 650-kW, 1,500-cycle Metrovick motor-generator set, which is double wound so as to enable the two halves to be used together or separately. Various arc furnaces installed include 4- and 5-ton types with either electric or hydraulic control for raising the electrodes. After seeing various pieces of stone-crushing and conveying apparatus being constructed, the delegates had a quick look at the sub-station, a portion of which has been laid out as a museum, where specimens of the various types of steel alloys and their applications are to be seen.

The cutting of manganese steel was, until a year or two ago, thought impossible, so that particular interest was taken in this process, one of the secrets of which is the low speed used. Considerable interest was also taken in the drilling of steel rods for mining work. A new shearing machine was seen in course of erection at the factory, and it was noticeable that the company is taking the opportunity, whenever possible, of changing over all machinery to individual drive. Two more electric furnaces, each of 10-ton capacity and taking 3,800 kVA, were then inspected, and after that four furnaces of

40 or 50 tons each, operated by producer gas. The tour concluded with a quick look round the largest of the rolling mills.

While the men were at Hadfield's works, the ladies also had an interesting morning at the factory of Walker & Hall, Ltd., silversmiths, &c. Afterwards coaches took them to rejoin the menfolk at Firbeck Hall Club for lunch as guests of the Baldwin Electrical Co. Mr. W. T. Baldwin, a director of the company, extended them a warm welcome.

An Unexpected Bathe

After an official photograph there was to have been a coach drive through Derbyshire, but an unexpected blaze of sunshine upset the time-table for the one and only time during the whole convention. The swimming bath in the grounds looked so inviting that thirty or forty of the hardiest of the delegates could not resist a dip, and the remainder stayed to watch or take part in a putting competition. We did not see anyone taking advantage of a rival attraction offered, namely, horse-riding. Back in Sheffield there was in the evening a civic reception, with concerts and dancing at the Town Hall, the Lord Mayor, Alderman W. J. Hunter, and the Lady Mayoress greeting the guests on their arrival.

The Thorncliffe iron works of Newton, Chambers & Co., Ltd., which the Association visited on Friday, occupy 15 square miles of territory between Sheffield, Barnsley, Rotherham and Penistone, with collieries, coke-ovens, chemical by-product plant, engineering works, moulding shops, blast furnace plant, and factories and warehouses for dealing with products of coal oil. With kind consideration for the delegates' legs the company arranged for the major portion of the tour to be done

Mr. C. Hollander, commercial manager of the English Electric Works at Stafford, Mrs. McGuffie, Mrs. Hollander, and Mr. H. A. McGuffie, the president

by a film, which also contained a brief representation of the formation of the company nearly 150 years ago.

An opportunity to see up-to-date production methods was then furnished by a visit to the company's Izal works. A general illumination of 10-12 ft.-candles is provided all over the machine room, and music from loud speakers is found to increase production. Each week the operators of the machine with the greatest output are presented with three pairs of silk stockings and given a pennant to attach to their machine. The arrival at the iron works was timed for just when a cast was about to be made.

Luncheon was taken at the Newton Memorial Hall. Mr. H. E. G. West, manager of the Izal Works, proposed the toast of the guests, and this was seconded by Mr. W. T. Kitching, general manager of the Thorncliffe iron works, who mentioned that twenty-seven mercury arc rectifier sets had just been provided to enable a supply to be taken from the Yorkshire Electric Power Co. Mr. J. E. Longden, vice-president of the Association, responded. Professor D. Hay, who presided, said that the company could claim to have done a certain amount of pioneering work in the use of electricity in mines.

At the annual general meeting in the afternoon the report and accounts were unanimously adopted. Presenting a report on prizes awarded for papers submitted by members, Mr. T. H. Williams, the president-elect, regretted that no paper was considered worthy of the gold medal. The following awards had, however, been made :—Grade I : Mr. A. E. Crook (North-Western Branch), 8 guineas; Mr. R. Wilson (West Scotland), 5 guineas; Mr. W. G. Turnbull (Ayrshire), 3, guineas. Grade II : Mr. J. Webster (West Scotland), 5 guineas; Mr. J. Irvine (Lothian), 4 guineas. Student's prize : Mr. J. Cameron (Cumberland), 2 guineas. Mr. G. E. Gittins, reporting on behalf of the Examination Committee, announced that the oral examination to be held in September would be extended to include mechanics, and that a written examination

Mr. C. A. Coates, hon. secretary of the Yorkshire South-East Branch, with Mrs. Coates and Miss H. M. Maurice, the only woman member of the Association

for the mechanical engineer had been arranged to take place in April next.

Before delivering his report the eretiring president, Mr. McGuffie, suggested that a telegram of good wishes should be sent to Mr. Sanders, late secretary of the Association, who has been in poor health. Mr. McGuffie stated that the oral examination had been put into operation with satisfactory results, and that 555 had now taken it. The work of the branches had been very satisfactory and membership stood at 2,937, the increase being attributable largely to the introduction of the examinations. The ballot for the election of officers for the ensuing year had resulted in the following appointments: Mr. D. H. Williams, president; Mr. S. B. Haslam, first vice-president; Mr. A. M. Bell, second vice-president; and Mr. F. Peckett, treasurer. Mr. W. T. Williams proposed a vote of thanks to Mr. McGuffie.

The presidential address, which Mr. W. T. Williams presented after his induction, took the form of a review of the Report of the Royal Commission on Safety in Mines. He stressed the importance of all members of the Association making every effort to comply with the Committee's recommendations and thereby assist in making mining a safe industry. It was very creditable, he said, that, while the technique of mining was advancing rapidly in the direction of complete mechanisation, resulting in the introduction of more and more electrically driven machines into and in the vicinity of the coal face, the increase in the accident rate was nothing like a proportionate one. In fact, electricity was responsible for only a very small proportion of the total accidents, and though it was often quoted as a very serious risk so far as explosions were concerned, statistics did not support that view.

Plenty of Scope for Development

Even when allowance was made for seams where machine mining was unsuitable, there was considerable scope for further development in the use of electrical apparatus, and it was not difficult to visualise a still more rapid growth in figures relating to the portable and semi-portable machines.

The president with (left) Messrs.W. O. Humphreys and J. F. Squire at Hadfields East Hecla steel works

The question of safety and adequate maintenance was bound up with the periodical examination of the apparatus, and few would quarrel with the contention that it was desirable that all apparatus in use at or adjacent to the coal face should be examined at least once every day.

The findings of the Commission on the question of the examination and certification of colliery electrical staffs was of the greatest importance to the Association, which was willing to co-operate in any way possible. It would appear that this was the opportune time for the educational authorities and technical colleges to introduce a colliery engineering course comprising both electrical and mechanical subjects. If a high standard were established there would be no reason why a certificate for colliery engineers should not eventually attain a status equivalent to that of the colliery managers' certificate.

The fact that the automatic protection of circuits fostered by Mr. Horsley had increased by leaps and bounds indicated that engineers had become aware of its value, and that the use of switch and fuses on power circuits was dying out. The fact that the best safeguard against fire was the provision of leakage protection could not be disputed, but it remained for the Committee to decide how far it was applicable. Remote control was very valuable, but its compulsory use might possibly be limited to certain situations. An earthed system was undoubtedly best since it allowed leakage gear to be used, but it was a moot point whether the cost of converting an insulated system could be justified if only surface plant was involved. Though there had been great progress in the manufacture of trailing cable, finality had not yet been attained and greater mechanical protection was still being sought. Safety in mines depended on the close co-operation of all concerned.

The *finale* of the Convention was the annual dinner and dance at the Royal Victoria Hotel on Friday evening. The first toast was that of "The City of Sheffield," proposed by Mr. A. B. Muirhead, who referred to the favourable prices charged for electricity in the city, and mentioned the small number of unemployed in Sheffield, due not only to armament work but to the production of articles in daily use.

Both the University's research laboratories and the A.M.E.E. were making their own contribution to the safety in mines. The Association was concerned not with the pressing of the case for the certification of the mining engineer, but with providing facilities whereby a man who was in charge of electrical machinery might secure a certificate of competency, if it was required. The Lord Mayor responded.

Professor Douglas Hay, proposing the toast of "The Association," said that the A.M.E.E. gave invaluable aid in the development of the uses of electrical apparatus in mines, without which the recent progress would not have been possible. In fact, without electricity many mines would have had to shut down. He believed that modern mines were both very safe and very efficient, a state of affairs for which the association was largely responsible. The outstanding problem was that of cables, and they were still waiting for the perfect fireproof type which manufacturers would some day provide.

In replying, the President stated that 50 per cent. of the coal used in the country was cut by machinery and 55 per cent. conveyed by machinery, so that there was still plenty of scope for development.

Other speakers were Major S. B. Haslam, Sir Walter Benton Jones, Capt. I. Mackintosh, Capt. S. Walton-Brown, and Mr. H. A. McGuffie. The "high spot" of the dancing was an eightsome reel performed by the Scotch contingent at the request of the Lord Mayor.

Delegates leaving the new high-voltage testing laboratories at the English Electric Works, and (right) entering the cinema to see a film of Newton, Chambers and Co.'s Thorncliffe iron works

Electrical Apparatus for Cinemas

ELECTRICAL apparatus used in cinemas is well represented at the trade exhibition held this week in the Casino, Blackpool, in connection with the annual conference of the Cinematograph Exhibitors' Association. The Western Electric Co., Ltd., shows the fruits of recent researches to improve sound reproduction systems, including an interesting new "Mirrophonic" acoustic system, with the "Thermoproof Kinetic Scanner," and a single sprocket threading, non-vibrational drive, constant speed motor with overload sentry, 100 per cent. ball-bearing operation and single shot lubrication.

To demonstrate its rotary stabiliser, R.C.A. Photophone, Ltd., has arranged a display consisting of a loop of 6,000-cycle frequency film running continuously through the sound-head. The film signal from this source is amplified in the 40-W amplifier forming part of the exhibit and the output can be viewed on the screen of a cathode ray oscilloscope.

Decorative lighting equipment for cinemas is presented by Holophane, Ltd., while the General Electric Co., Ltd., shows a complete range of carbons for low intensity types for mirror arc lamps; high intensity types, both coppered and uncoppered; studio carbons and a range of the more popular types, as well as "Osram" lamps and fluorescent tubing. Neon Luminations, Ltd., demonstrates the Shaw moving sign, the interchangeable letters of which are unbreakable and can be stored in a small space. A range of cinema projectors is displayed by Kalee, Ltd.

The Hewittic Electric Co., Ltd., presents two interesting examples of its "Econotrol" cinema arc rectifiers, which are designed so as to require no ballast resistances. One model intended for news theatres, etc., where frequent adjustment is necessary, is equipped for continuous and even adjustment even during the showing of the films. Automatic feed high intensity projector arc lamps for AC and DC working are shown by Cinesales, Ltd.

A new soundhead employing the "Viscous Rotor" principle is incorporated on a "Duosonic" sound equipment demonstrated by G.B. Equipments, Ltd., who also show Baird screen television projectors. The Electric Construction Co., Ltd., show three mercury arc rectifiers of the "L.P.," induction control and battery charging types, while the Westinghouse Brake & Signal Co., Ltd., has arranged its stand in the form of a projection room so as to demonstrate its twin arc metal rectifier units, one of which operates from three-phase mains in the normal manner and the other from single-phase mains through a static phase convertor.

Other exhibitors are Ship Carbons; Hall & Dixon, Ltd.; the Strand Electric & Engineering Co., Ltd.; J. Frank Brockliss, Ltd.; Sound Equipment, Ltd.; Pathé Equipment, Ltd.; W. J. Furse & Co., Ltd.; B.T.P. Sales & Service; K.F.M. Engineering Co., Ltd.; Morgan Crucible Co., Ltd.; F. H. Pride, Ltd.; the Hendon Lamp & Accessories Co., Ltd.; Nife Batteries, Ltd.; and the Etna Lighting & Heating Co., Ltd.

THE I.E.E. AT MANCHESTER

Successful Summer Meeting

IT is sixteen years since the Institution of Electrical Engineers last included a fleeting visit to Manchester in one of its annual summer meetings, so that last week's tour at the invitation of the North-Western Centre provided a fuller opportunity of appraising local electrical activities. There cannot be two opinions about the success of the meeting; even the weather exceeded expectations, though there were little more than two-thirds the usual number of participants, and of the 240 who attended over one hundred did not take part in the whole of the meeting.

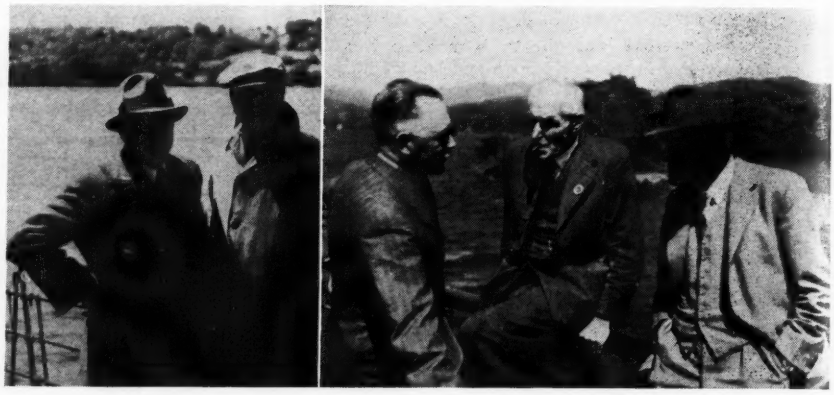
Proceedings commenced informally on the Monday evening with a reunion, light refreshments and music at the Midland Hotel, which served as headquarters, under the presidency of Dr. A. P. M. Fleming and local chairmanship of Mr. W. Fennell, whose successor in office will be Mr. O. Howarth, with Mr. H. Cobden Turner as vice-chairman.

A somewhat dismal first morning failed to damp members' eagerness to set out, usually in two parties, on daily alternative visits to works and factories at most of which mid-morning refreshment or afternoon tea was provided, together with souvenirs for the ladies. Cameras were not this year allowed in any of the works visited.

There were two civic functions, followed by dancing with

Dr. A. P. M. Fleming (President, I.E.E.) and Mr. Johnstone Wright (chief engineer, C.E.B.) have a breezy trip

vocal and orchestral concerts and refreshments. A formal atmosphere seemed to prevail on the first evening at the Town Hall, Manchester, where the guests were received by the Lord Mayor, Councillor E. J. Hart, and Lady Mayoress, Miss B. Hodsman. There was more spontaneous gaiety on the next night at the Royal Art Gallery, Peel Park, Salford, when guests were received by the Mayor and Mayoress, Councillor and Mrs. J. T. Harrison, the hosts on this occasion being the Light, Heat and Power Committee, of which Councillor C. J. Townsend is chairman. Floral decorations arranged on both occasions by the respective Parks Committees were much admired.



On Lake Windermere :—One of the local secretaries, Mr. A. L. Green (extreme left), and (right) Messrs. W. A. A. Burgess, Eustace Thomas and Bertram Thomas

The third day was devoted to an excursion by special train to Lakeside, with a cruise on Lake Windermere in brilliant weather. Academic robes added colour to the evening reception and dance at the University, Manchester, by the vice-chancellor, Prof. J. B. Stopford and Mrs. Stopford, and the chairman of council, Sir Christopher T. Needham and Miss Needham.

University Exhibits

There were exhibits of testing machines in the engineering laboratory and high-voltage phenomena and gas-discharge tubes in the electro-technics department, while the physics department demonstrated a differential analyser of "Metrovick" construction for mechanically solving mathematical equations, lately improved by the addition of photo-electric "feeding" heads. Apparatus for research on cosmic rays includes a large "Metrovick" electro-magnet for diverting the path of single sub-atomic particles as a means of calculating their extremely high energy. A continuous recorder has very recently provided new photographic evidence of cosmic-ray showers.

The first day's official luncheon took place at the Midland Hotel, where 175 guests were entertained by the Chloride Electrical Storage Co., Ltd., whose chairman, Mr. W. S. Naylor, referred to the works welfare, social and recreational activities and explained how under the direction of the company's resident medical officer and his staff only two new cases of lead poisoning had occurred in 12 years. In reply, Dr. A. P. M. Fleming, president of the I.E.E., mentioned that the visit to the Exide works had left in him a feeling of national pride at the multifarious uses of batteries and a

Mr. W. Fennell (chairman of the local centre) being welcomed at the Irlam Steel Works. Right : Mr. and Mrs. Kenny (Irish Centre) at Mather and Platts

realisation, too, of what an important function the factory would fill in a time of national emergency.

On the next day Sir Felix J. C. Pole, chairman of the Metropolitan-Vickers Electrical Co., Ltd., occupied the chair at both luncheon and tea in the works canteen at Trafford Park. In replying to his speech of welcome, Dr. A. P. M. Fleming expressed officially the Institution's appreciation of the very generous hospitality extended by the company, which was still further added to on the last night (Friday) when Sir Felix and Lady Pole received some 400 guests at a dance and cabaret performance which brought a highly successful meeting to a brilliant climax.

The day before at an informal I.E.E. luncheon the president had thanked the North-Western Centre for its strenuous endeavours to assure the success of the meeting, mentioning particularly the secretarial tasks of Messrs. L. H. A. Carr and A. L. Green (local), and of Messrs. A. E. Rayner and R. C. Chapman (London staff). May we add our own appreciation of Mrs. Carr's thoughtful co-operation on behalf of the ladies.

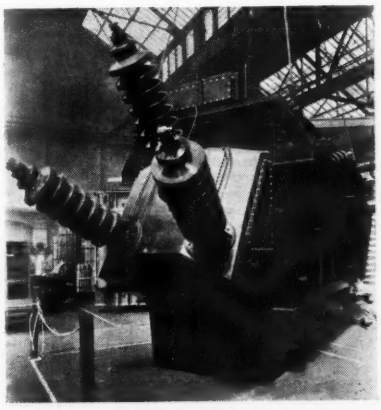
The Exide Works

Transport throughout was by Manchester Corporation motor coaches, the first of the daily alternative visits being to the Bower Street handkerchief factory of the Tootal Broadhurst Lee Co., Ltd., chiefly for the instruction of the ladies. A second party of 100 (men only) was conveyed to the Exide works of the Chloride Electrical Storage Co., Ltd., at Clifton Junction, which are remarkable not only on account of process mechanisation, but also for the very complete protective medical supervision of the employees.

These works and offices occupy nearly 15 acres. The most spectacular section is perhaps the moulding department, in which lead sheet and tape are rolled, perforated and pressure-cast into a variety of types of accumulator plates. From this "White City," so nicknamed on account of the prevalence of white dusting powder used to prevent casts sticking to the slit-mouth moulds, we went into the department where plates are filled with oxide paste by hand and with the aid of conveyor-type machines operating at surprisingly high speeds. The respirator masks, protective clothing with caps and heavy rubber boots worn by the workers while standing on tiled floors constantly flooded with water are part of the elaborate precautions against lead poisoning.

The Lancashire Electric Power Co. was host in the afternoon when the party again divided for inspections of the Kearsley power station and the domestic appliances and meter testing station at Walkden (see ELEC. REV., pp. 85-86, January 20th, 1939), rejoining for tea at which Mr. C. D. Taite, engineer and manager of the Power Co., presided.

At the Kearsley station coal wagons are hauled by two electric locomotives drawing DC at 500 V from overhead wires. There is no steam connection between the two sections of the station and an unusual feature is that only two motors per boiler are installed, each driving a forced and an induced draught fan on the same shaft through variable speed hydraulic couplings. To obviate continuous slip on the couplings the motors are of two-speed type, the lower speed sufficing for normal load. Grit arresters are not installed.



Met-Vick transformer—the first of its kind—built for the C.E.B.

Two B.T.H. 31,250-kW turbo-alternators generate at 11 kV with single-phase transformation to 33 kV, at which voltage the two 50,000-kW machines generate direct. The set last installed has been dismantled. Condenser water is drawn partly from the River Irwell and partly from cooling towers situated on the opposite bank of the river. To cope with consequent variations in head some of the pump motors have been fitted with Scherbius control for speed regulation. All three cooling towers, one of which is now being constructed, are of the hyperbolic ferro-concrete type, each being 260 ft. high, 175 ft. in diameter at the base and capable of reducing by 14 deg. F. the temperature of 3,000,000 gallons of water per hour.

There is a laboratory equipped for the routine testing of coal, oil and feed water at the L.E.P. Co.'s three generating stations at Kearsley, Radcliffe and Padiham. Analytical work is also done for other departments and, in addition, a considerable amount of investigation has been carried out on the collection and elutriation of dust in flue gases for the British Standards Institution.

On the second morning both parties proceeded to Barton, where one of them was received by Mr. H. C. Lamb, chief engineer and manager, at the Manchester Corporation's power station while the other party was guided by Mr. E. J. Dunstan, works manager, on a tour of inspection of the nearby works of the Manchester Oil Refinery, Ltd., whose sales organisation is British Transformer Oil & Lubricants, Ltd. This plant is not yet two years old; it is electrically driven, and the raw materials are pumped direct from large vessels brought up the Manchester Ship Canal. The refinery specialises in the production of high-grade lubricants, but insulating and white oils are also now being produced. Special plant has been installed for this purpose and transformer oil marketed under the trade name of "Tramor" in grades "A" and "B" is guaranteed to comply with B.S. Specifications and to be distilled and refined entirely in Britain. Hitherto almost all the transformer oil utilised in Great Britain has been imported mainly from the Continent.

Mrs. L. H. A. Carr, Mrs. H. Barson and Miss M. Rosenberg.

The second afternoon was spent at the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., where exhibits were on view in the various shops. For instance, among motors for different industries were examples of the use of glass insulation. There was also on view the first of five 30,000-kVA, 132/32 kV type OFB mobile transformers specially designed for transport by road or rail complete with all bushings, cooling equipment, and other accessory apparatus in position ready for service. They are to form part of the national reserve of equipment of the Electricity Commission. The cooling equipment consists of duplicate air-blast oil coolers mounted at one end of the tank, each complete with oil circulating pump of the glandless type, and with air blower. Each cooler is capable of dealing with half the total loss of the transformer. A separate chamber between the transformer and the cooling equipment houses a unit auxiliary transformer and from these, four separately fused circuits are run to the pump and fan motors. At the other end of the tank the three high-voltage bushings are mounted in a pocket, and the internal arrangements are such that any bushing can be replaced without draining oil from the main transformer tank. The transformer is fitted with off-circuit switches and with a conservator.

Messrs. L. H. A. Carr, W. O. Fenwick, V. M. Farrant, E. J. Dunstan and R. M. Charley at the Oil Refinery

"Thermac" AC welding equipments are the company's latest type with which smooth control of welding current over a wide range is achieved without the use of any tappings. An

article in the "M-V Gazette" for April, 1939, described and illustrated the new construction.

Six 132-kV capacitor voltage transformers for the C.E.B. which were on view consisted fundamentally of a condenser potential divider and an adjustable tuned circuit for stabilising and correcting the voltage tapped off across the low-voltage stage condenser. These particular capacitors are intended for use both with instrument and carrier current protection.

A cinema film exhibited at the works and repeated at the hotel on the last evening was entitled "Planned Electrification," illustrating the conversion from steam to electric working of the Bickershaw Colliery, Leigh, Lancashire. Complete reorganisation of the surface equipment has taken place in the last two years, the whole of the electrical equipment having been handled by tht Met.-Vick. Co., which was thus able to co-ordinate the scheme.

The Met.-Vick "Ripplay" system of centralised control enables either all or selected groups of such apparatus as water-heaters and space-heaters to be switched on or off from the central station, and the load curve can often be levelled in this way to a very valuable extent. The system is suitable also for controlling two-rate (double tariff) meters, street lighting, air-raid warnings, and so on by one signal, or divided into groups, each responsive to a different signal. The ripple-injecting equipment is connected to the distributing system at one point only, and calls for no alteration to an existing network; nor does it employ series-connected transformers, or otherwise necessitate switchgear modifications in the high-voltage bus-bars or feeders.

On the last morning both parties set out for Irlam, one of them (mostly ladies) going to the soap works of the Co-operative Wholesale Society, Ltd., while the men toured the steel works of the Lancashire Steel Corporation, Ltd., a feature of which is the very extensive system of air-raid shelters. Mr. J. Sinclair Kerr explained the combination on one site of coke ovens, blast furnaces, open-hearth furnaces, rolling mills and all auxiliaries for the production of finished steel from the raw materials. The plant for unloading the latter from ships in the Manchester Ship Canal, or the railway sidings, has no counterpart in Great Britain and is all electrically driven, as also are the rolling mills (Ilgner English Electric system) and their auxiliaries, which possess many unusual features.

Besides purchasing electricity the works generates a considerable amount of power by means of blast-furnace gas engines, which usually carry the base load while fluctuations are taken over by turbine sets supplied with steam from gas-fired and waste-heat boilers. By-products are recovered from the coke ovens, and furnace slag is made into road paving materials and conduit for electric cables, &c., the plant as a whole being maintained in an unusually orderly condition for a steel works of such size.

Outside the Barton power station. Among the group are Mrs. P. Dunsheath and Mrs. R. W. Gregory, and on the right-hand side, Messrs. A. C. Sparks, H. Hobson, R. W. Gregory and Dr. P. Dunsheath.

The last afternoon was occupied by a tour of the Park Works of Mather & Platt, Ltd., at Newton Heath, where Mr. L. S. Mather presided at tea in the canteen. An exhibition of cinema films was arranged for the benefit of those ladies who preferred not to undertake the longer works tour. This tour emphasised the very diverse nature of the products of this pioneer concern, which entered the electrical manufacturing field as early as 1882, and is equally well known for its textile equipment, pumping plant and fire-fighting apparatus. It concluded with a series of striking demonstrations of the "Mulsifyre" system of extinguishing oil fires.

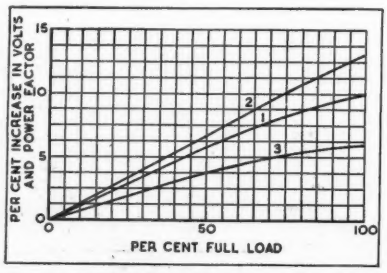
Other demonstrations showed how ineffective incendiary bombs of the so-called electron type (a tube of magnesium charged with thermite) are when attacked promptly with water from a "Mulsifyre" projector or a soda-acid "Simplex" extinguisher.

X-ray Voltage Regulation

VOLTAGE regulation by means of step-by-step tap changers, induction regulators or similar apparatus is not quick enough for many purposes, such as X-ray equipment, for which it must be instantaneous. Due to the comparatively low power factor of the circuit, the load thrown on the supply mains often causes a large voltage drop which seriously affects the efficient working of the X-ray equipment.

The "capacity booster," manufactured by the British Electric Transformer Co., Ltd., has been applied successfully to several such cases. This consists essentially of a transformer with its secondary connected to a static condenser, and its primary in series with the line. As a condenser characteristic is opposite to that of a reactance it produces a voltage rise which increases with load and also with lowering of load power factor.

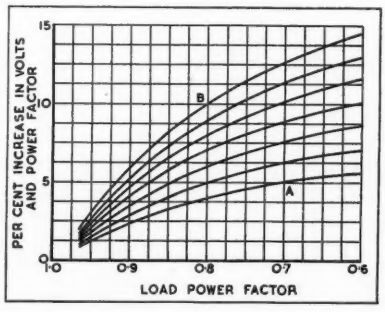
The voltage variation is smooth and is approximately a straight line, and the percentage improvement in power factor at any load is equal to the percentage boost. More boost is given for a lower power factor — a desirable feature, since line drop is greater when the power factor of the load falls. No appreciable error is introduced by assuming that the boost is proportional to the load from zero up to full load.



Curve 1: 0.8 p.f. load (normal). Curve 2: 0.7 p.f. load. Curve 3: 0.9 p.f. load

Curves showing variation in boost with different loads and power factors. Booster designed to give 10 per cent. boost with 0.8 p.f. load

As an example of how the full-load boost obtained varies with loads of different power factors, assuming a booster designed for a boost of 5 per cent. at 0.7 power factor, run up the 0.7 power-factor ordinate on the appropriate curve until the 5 per cent. boost position is reached (point A). Then the curve on which this point lies will give the full-load boost at other power factors; e.g., nearly 2½ per cent. with a 0.9 power factor.



Curves showing variation of full load boost with loads of different power factors

Again a booster giving 10 per cent. boost at 0.8 power factor will give a boost, when transferred to a 0.6 power-factor load, the value of which can be ascertained by running up the 0.8 power-factor ordinate until 10 per cent. boost is reached (point B). Following the top curve to 0.6 power factor, the boost at full load is found to be 14½ per cent. In any particular case the boost at reduced load may be taken as proportional to the load.

Standard tappings allow of the boost being reduced to approximately 90, 80 and 70 per cent. of its normal value. The same tappings may also be used to adjust the booster for use on a load of power factor other than that for which it was originally designed.

SYNCHRONISING POWER

A Fundamental Aspect of System Operation

By H. Rissik

TRANSMISSION of electric power by means of alternating current can take place in two fundamental ways. The almost universal way is that based upon synchronous operation, i.e., in which the machines at both ends of the transmission system are of the synchronous type, with their speeds fixed at values corresponding to a definite system frequency and independently of the power transmitted. The synchronous tie, whether embodied in an underground cable or in an overhead line, is inherently rigid and may suddenly break asunder if called upon to transmit an excessive amount of power.

Asynchronous operation, on the other hand, is obtained when neither or only one end of the transmission system has synchronous machines connected to it. For example, a generating station, equipped with synchronous machines, may supply an asynchronous load, such as a network comprising a combination of static impedance (AC lighting and heating) and induction motors; or an asynchronous generating station, equipped with induction generators, may be required to supply a load consisting either of static impedance, induction motors, or synchronous motors, or of any combination of these load types.

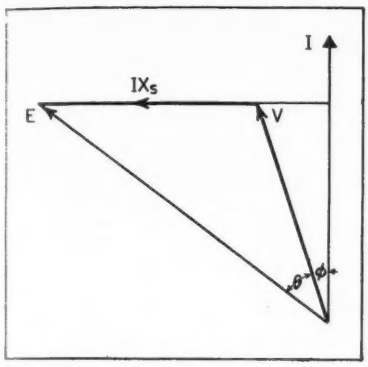


Fig. 1

In such cases the speed relation between the machines at the two ends of the transmission system is no longer fixed, but depends upon the power transmitted. The asynchronous tie between generator and load is inherently flexible, and is capable of transmitting power to an extent limited solely by the capacity of the machines. This inestimable operating advantage of asynchronous power-transmission systems is a considerable counterweight to the technical disadvantages associated with induction generators and explains why consideration has recently been given to the possibility of using such a system for long-distance transmission.*

Although the property of electrical rigidity inherent in synchronous transmission is fundamental to the correct operation of present-day AC power systems, a quantitative, and even a qualitative, analysis of synchronism—as this vital property is termed—often eludes the grasp of the power system engineer, who inclines to the view that this problem is the concern of the machine designer. And so it is, up to a point. Beyond that point, however, the essentials of synchronous operation become bound up with the phenomenon of synchronising power, and it is this particular kind of power with which the system engineer is primarily concerned, for it is upon the ability of his power system to transmit this power under all possible conditions of operation, both normal and abnormal, that the commercial utility of that system ultimately depends.

An "Elastic" Link

To appreciate the true significance of synchronising power, it is necessary to bear in mind that the concept of a perfectly rigid electrical tie suggested by the above definition of synchronism is not strictly applicable, for the machines at the two ends of a transmission system are synchronous only in the sense that there is no slip between the rotating unidirectional magnetic field emanating from the rotor poles and the corresponding revolving magnetic field set up by the polyphase currents flowing in the stator windings. Although these fields are in synchronism, the link between them is not absolutely rigid, but elastic; and it is the elasticity of this invisible link which is the basis of synchronous operation *per se*.

The torque exerted by or on the rotor shaft of a synchronous machine depends directly on the amount of stretch of this elastic link. The one is a measure of the other. In fact, the existence of such a torque is the physical manifestation of the forces brought into play by the mutual displacement of the two synchronously rotating fields. The field due to the rotor excitation is set up in a direction along the rotor-pole axis. The direction of the field set up by the stator currents, however, depends partly upon the phase displacement between these currents and the voltages to which they are due, and which appear at the machine terminals; and partly upon the further phase displacement between these terminal voltages and the induced EMFs to which they correspond, and which are to be regarded as being generated by the resultant field of the machine (i.e., the "vector sum" of the rotor and stator fields).

In a synchronous machine under load conditions, then, the reaction of the stator field upon the rotor field (armature reaction) causes the rotor-pole axis to be displaced in phase from its no-load position by an angular amount depending upon the machine load. This same angular displacement then exists between the no-load EMF and the equivalent load EMF generated by the resultant field of the machine. Also, as mentioned above, a further angular displacement exists between this EMF induced under load conditions and the machine terminal voltage. These phase displacements are due to the inherent reactances of the machine.† The first of these, the so-called magnetising reactance, causes a reactive voltage drop represented in the vector diagram by the vector subtending the first angle of displacement. The second of these reactances, the leakage reactance, causes a further reactive voltage drop represented by the vector subtending the second displacement angle.

The aggregate angular displacement θ between the no-load EMF E and the terminal voltage V of the machine is then subtended by the so-called synchronous reactance drop IX_s as shown in Fig. 1. Neglecting all power losses, the electrical power of the machine (per phase) is then

$$P = VI \cos \phi = EI \cos (\theta + \phi) = \frac{EV}{X_s} \cdot \sin \theta \quad \ldots\ldots\ldots\ldots \quad (1)$$

as, from the trigonometry of fig. 1, we have

$$\frac{V}{\cos (\theta+\phi)} = \frac{E}{\cos \phi} = \frac{IX_s}{\sin \theta}$$

In other words, the electrical power of a synchronous machine can be expressed as a simple function of the angular displacement θ between the "internal" or air-gap voltage E and the "external" or terminal voltage V. Furthermore, this angular displacement is a direct measure of the reactive voltage drop IX_s due to the load current flowing in the synchronous reactance of the machine.

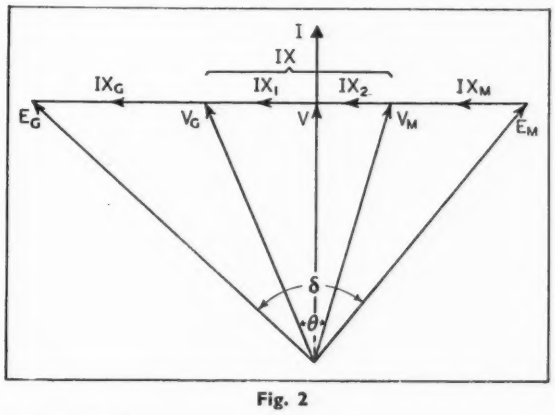


Fig. 2

The vector diagram of a simple transmission system, comprising a synchronous generator, a power-transmitting link such as an overhead line or underground cable, and a synchronous motor, is given in fig. 2. E_g and V_g are the air-gap and terminal voltages of the generator, E_m and V_m those of the motor. X_g and X_m are the synchronous reactances of

* See for example *Elektrotechnik und Maschinenbau*, 1938, Vol. 56, pp. 405 and 542.

† *Vide* H. Rissik: "Alternator Performance," ELECTRICAL REVIEW, 19th August, 1938, p. 243.

the two machines and X that of the interconnector, whilst I is the load current corresponding to a certain transmitted power P. Furthermore, θ is the angle of displacement between the voltage vectors at the termini of the power link, and δ is the corresponding angle between the machine air-gap voltages. This latter angle is, in fact, the total angular displacement between the machine rotors, for these are the physical elements of the power-transmission system which normally operate in synchronism.

The synchronising power of the system is then the electrical power, transmitted by the synchronous tie between the two machines, necessary to maintain the machine rotors in synchronism under given conditions of shaft loading (*i.e.*, mechanical torque).

Referring to fig. 2, it can be shown by trigonometry (as in the case of fig. 1) that the synchronising power per phase is given by

$$P=VI=\frac{V_G V_M}{X}.sin\,\theta=\frac{E_G E_M}{(X_G+X+X_M)}.sin\,\delta \quad .....(2)$$

As the load increases, and with it the several reactance drops IX_g, IX, IX_m, so also the displacement angle δ increases. And, as indicated by (2) as long as δ is less than 90 electrical degrees the synchronising power P will go on increasing in response to the load demand. But as δ approaches this critical value, successive load increments result in progressively diminishing increments of synchronising power. In other words, the rate of increase of electrical power transmitted (P) with the vector displacement angle (δ)—termed the synchronising power coefficient ($dP/d\delta$)—steadily diminishes, and reaches zero when $\delta=90°$. If the load should increase still further, so that $\delta>90°$ (and $dP/d\delta$ becomes negative), the synchronising power begins to decrease with increasing load and synchronism is lost; *i.e.*, the machines at the two ends of the transmission system fall out of step.*

The power-transmitting capacity of the synchronous tie between the two machines is thus limited not to the capacity of the smaller machine but to the maximum value of synchronising power as given by (2), which may or may not be less, depending on the design of the transmission system. This maximum value (the so-called *power limit* of the system) is equal to

$$P_{max.}=VI_{max.}=\frac{E_g E_m}{X_g+X+X_m}$$

and is clearly reached when $\delta=90°$. In that case, and referring again to Fig. 2, the right-angled voltage vector triangle gives $V^2=(I_{max}\,X_a)\times(I_{max}\,X_b)=I^2_{max}\,(X_a\,X_b)$, so that $V/I_{max}=\sqrt{X_aX_b}$, where $X_a=(X_g+X_1)$ and $X_b=(X_m+X_2)$; also $(X_1+X_2)=X$. Hence $P_{max}=V^2\Big/\left(\frac{V}{I_{max}}\right)=\frac{V^2}{\sqrt{(X_aX_b)}}=\frac{V_g^2\sqrt{X_aX_b}}{X_1^2+X_aX_b}=\frac{V_m^2\sqrt{X_aX_b}}{X_2^2+X_aX_b}$ ..... (3)

As only the terminal voltages, V_g and V_m, and the several reactances, X_g, X and X_m, are known, it is necessary to evaluate X_1 and X_2 in terms of these five circuit constants in order to determine the maximum synchronising power (i.e., the system power limit) from equation (3). If r denote the terminal voltage ratio V_g/V_m then

$$r^2=\frac{V_g^2}{V_m^2}=\frac{V^2+(I_{max}X_1)^2}{V^2+(I_{max}X_2)^2}=\frac{X_1^2+X_aX_b}{X_2^2+X_aX_b}$$

from which, with $(X_1+X_2)=X$, one obtains the relation

$$\frac{X_1}{X_2}=\frac{r^2X^2+(r^2-1).X_g(X+X_m)}{X^2-(r^2-1).X_m(X+X_g)}$$

Assuming $X_1>X_2$ one may put $X_1=(\frac{1}{2}X+x)$ and $X_2=(\frac{1}{2}X-x)$ where $x=\frac{1}{2}(X_1-X_2)$. After some transformation one finds that

$$x=\frac{(X_g+\frac{1}{2}X)(X_m+\frac{1}{2}X)+(\frac{1}{2}X)^2}{X\left(\frac{r^2+1}{r^2-1}\right)+X_g-X_m}$$

so that the maximum synchronising power is finally given by

$$P_{max}=\frac{(r^2-1)V_m^2}{2X}\cdot\sqrt{\left[\frac{1}{x^2}(X_g+\tfrac{1}{2}X)(X_m+\tfrac{1}{2}X)+\frac{1}{x}(X_g-X_m)-1\right]} \quad (4)$$

In the particular case where the terminal voltages are equal (e.g., in the majority of long-distance transmission systems), so that $r=1$ and $x=0$, the system power limit accordingly becomes $P_{max}=\frac{V_m^2\sqrt{[(X_g+\frac{1}{2}X)(X_m+\frac{1}{2}X)]}}{(X_g+\frac{1}{2}X)(X_m+\frac{1}{2}X)+(\frac{1}{2}X)^2}$, a well-known result already established by Nickle, Edith Clark and others† Another important special case is that in which the receiving end of the system (i.e., the synchronous motor) operates at unity power factor. Here $V_m=V$, $X_1=X$ and $X_2=O$, so that $X_a=(X_g+X)$ and $X_b=X_m$. Hence equation (3) becomes $P_{max}=V_m^2/\sqrt{X_m(X_g+X)}$. Incidentally, fig. 2 shows how the receiving-end power factor depends on the terminal voltage ratio r. For

$$\cos\phi_m=\frac{V}{V_m}=\frac{X_aX_b}{X_2^2+X_aX_b}=\frac{1}{1+(X_2^2/X_aX_b}$$

And X_2, X_a and X_b are all functions of r as well as of the individual system reactances X_g, X and X_m.

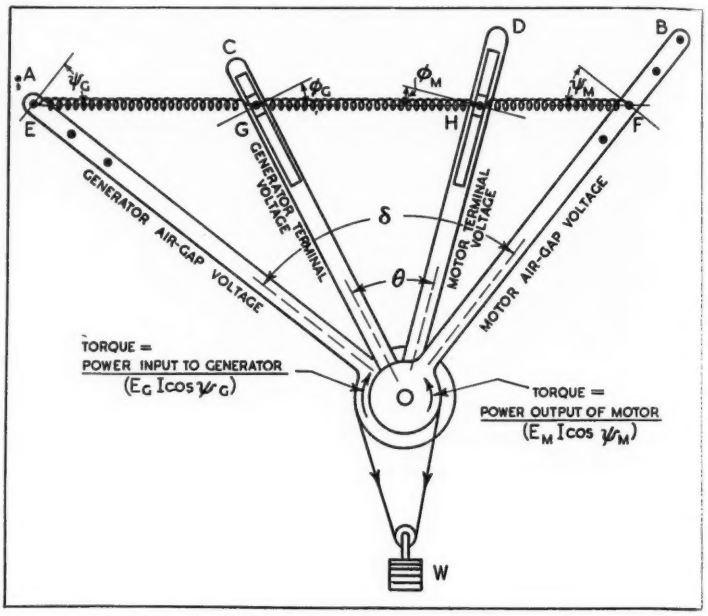


Fig. 2

The existence of a finite limit to the synchronising power of an interconnector can be readily demonstrated by means of the mechanical model illustrated in fig. 3, and an exact mechanical analogue of the simple power system represented by the vector diagram of fig. 2.

The model is, in effect, a synchronous mechanical transmission system which simulates very closely the action of a synchronous electrical transmission system. It consists essentially of four arms, A, B. C and D, pivoted independently on a common axis O. Arms A and B have large hubs in which are pulley grooves, these being spanned by a loop of cord which also passes round a small jockey pulley to which adjustable weights can be attached. The arms are linked by three springs at E, F, G and H. The end pivots E and F are fixed, whilst G and H are free to slide in radial slots.

If the arm lengths OE and OF are adjusted in proportion to the generator and motor air-gap voltages, E_g and E_m, then the spring extensions EG, GH and HF will equal, to the same scale, the reactive voltage drops IX_g, IX and IX_m of fig. 2. Similarly, the distances of the sliding pivots G and H from the axis O will represent the terminal voltages V_g and V_m. The spring tension acting between E and F is then equivalent to the load current I, whilst the torque exerted by either arm A or B, being equal to the product of the arm length and the component of the spring tension perpendicular to the arm, thus represents the electrical power, $P=EI\cos\psi$, of the appropriate machine (*Cf.* fig. 1).

If now the system is gradually loaded by adding weights W to the jockey pulley, all four arms will swing stably farther and farther apart, the relative separation depending on the strengths of the several springs, until the restoring torque due to the spring tension (*i.e.*, the synchronising power of the system) begins to diminish with increasing angle δ between arms A and B. A little consideration will show that this must happen when $\delta=90°$. For, although the spring tension (load current) increases with an increase in angle up to $\delta=180°$, the torque (electrical power) corresponding to the product of the arm length and the component of spring tension at right angles to the arm increases up to $\delta=90°$, beyond which angle

* *Vide* H. Rissik: "Parallel Operation," ELECTRICAL REVIEW, 25th November, 1938, p. 751.

†*Cf.* C. A. Nickle, *Trans.* A.I.E.E., 1926, Vol. 45, p. 1; Edith Clarke, *ibid.*, p. 22; W. W. Lewis, *Transmission Line Engineering* (McGraw-Hill Book Co., 1928).

‡ *Vide* S. B. Griscom: "A Mechanical Analogy to the Problem of Transmission Stability," *Electric Journal*, 1926, Vol. 23, pp. 230-5; also R. C. Bergvall and P. H. Robinson: "Quantitative Analysis of Power System Disturbances," *Trans. A.I.E.E.*, 1928, Vol. 47, pp. 915-28.

N.P.L. INVESTIGATIONS

Recent Advances

THE annual inspection of the National Physical Laboratory at Teddington took place on Tuesday of this week. Visitors were received in the high-voltage laboratory by Sir William Bragg (president of the Royal Society and chairman of the Board), Lord Rayleigh (chairman of the Executive Committee) and Dr. C. G. Darwin (director of the Laboratory). Some 1,500 guests toured the various departments and took tea in the aerodynamics section.

Apart from pure science and industrial aid, the work of the Laboratory has embraced food investigational problems and seems now to be extending into medical research. For example, the physics department has for some time had the structure of teeth under investigation by X-ray methods. This work has now been supplemented by the use of the polarising microscope, with which the crystalline orientation deduced by X-ray examination has been confirmed. This investigation has been undertaken for the Medical Research Council to determine the structures of the enamel and of the underlying dentine, and to observe how these structures may vary with different types of teeth which are subject to, or immune from, disease.

Estimation of the hæmoglobin content of the blood is of importance in the diagnosis and treatment of certain diseases, such as anæmia. This is done by taking a sample of blood from the patient, treating it with coal gas, then diluting it with water until the colour matches a standard. The method depends to a large extent on the accuracy of the colour of the standardised tubes. Apparatus has been designed to test these tubes and so enable the manufacturer to supply hospitals with standards of high quality.

Tests on Pipe Lagging

In the engineering department a new electrically heated pipe has been installed for making tests on materials used as pipe lagging. The important feature is the elimination of "end effect." At each end the pipe has an internal electric heater 1 ft. 6 in. long. A third heater 6 ft. long occupies the central portion. The temperatures of these heaters can be adjusted so as to give a uniform flow of heat radially from the centre portion of the pipe, no heat flowing longitudinally to or from the end sections. The electrical energy supplied to the central heater is measured and from this measurement the efficiency of the lagging may be calculated. This method of testing pipe coverings is much more simple and direct than any which has been used hitherto.

Thirty-four testing machines are in use to measure the "creep" of various materials at different temperatures and stresses, the amount of creep in a given time being very much influenced by the presence of alloying elements in steels and by differences in heat treatment.

In the investigation of "oiliness," static friction measurements are the most useful starting point. An existing machine has been adapted to give contact of balls with a plane, and a cleaning procedure has been found by which good repetition can be obtained for both the dry and lubricated conditions. The coefficients of friction of a variety of oils, mineral, fatty and extreme-pressure, have been found, as well as those of some pure chemical substances to show the influence of molecular weight and structure.

The qualities of oils affecting seizure have been investigated with an apparatus giving high contact pressures between ¼ in. steel balls. Significant results have been found for mineral and fatty oils, as well as for the extreme-pressure lubricants for which the apparatus was designed. Recent extreme-pressure lubricants of the lead-soap sulphur type differ from the milder type, but justify their choice for use with hypoid gears by taking the highest load the machine will impose without welding occurring. When a steel ball is rotating on bronze balls very high loads can be taken without seizure even with a mineral oil, showing the value of this combination of materials. This work is leading to an understanding of the mechanism of seizure.

In the radio department is a working model of a cathode-ray direction-finder for marine navigation, a direct visual indication of the bearing of the distant station. It registers the direction of arrival of signals in turn on the screen of the cathode-ray tube, which is graduated similarly to a compass dial. From the intersection of two bearings the position of the ship is fixed.

The radio department has developed a compact and light assemblage of radio apparatus which can be carried up into the upper atmosphere by a small balloon, about five feet in diameter, and transmits continuously modulated radio signals which convey measurements of the temperature, pressure, and humidity of the regions of the atmosphere traversed by the balloon, since the path followed by the balloon is determined by the prevailing wind, the reception of the same signals by direction-finding receivers suitably located on the ground enables the course of the balloon to be followed and the speed and direction of the wind to be determined.

A parachute is so arranged that when the flight is ended by the bursting of the balloon, the radio equipment is lowered to earth comparatively slowly by the parachute. Heights up to nine miles and distances of more than 100 miles have been reached, with good reception throughout, and in most cases the apparatus has been recovered without material damage.

The metrology department's exhibits illustrated typical methods used for verifying the accuracy of some of the many types of limit gauges used in modern engineering practice. In the simpler cases, the tests are carried out either by the direct use of slip gauges or with the help of simple comparators. For the more complicated types of gauges special measuring machines are used, most of which have been designed and constructed in the department.

In the metallurgy department, the automatic potentiometer and plotting chronograph, both devised in this department, have been further improved and were shown in operation. Curves which indicate transformations during the heating or cooling of solid alloys are recorded in a completely automatic manner with greater smoothness than when visual observation and hand tapping are used.

Action of Superheated Steam on Steel

Another apparatus was shown by means of which the action of superheated steam on steels under constant stress may be studied. The steel specimens are in the form of hollow "thimbles," stressed in tension by the internal pressure of steam, and maintained at a constant temperature by external heating in a regulated atmosphere. After the experiment, the scale formed on the steel is measured and examined microscopically.

In the aerodynamics department the study of the flutter of wings and other parts of aircraft demands a knowledge of the air forces acting on those parts when they are in rapid oscillation. The force which has to be applied to produce the oscillation is transmitted to the aerofoil through a short length of nickel tube, whose magnetic permeability changes with the stress in the material. By the use of suitable electrical apparatus these changes of permeability can be recorded and so furnish a means of measuring the rapidly changing force. The development of this apparatus has proved difficult, but it is now working very well.

In America an attempt has been made to provide a quick method of studying stability by making a tilting wind tunnel in which small models can actually be flown under electrical control and their behaviour watched. The N.P.L. is trying to achieve the same object in any ordinary wind tunnel without special apparatus.

Synchronising Power (*Continued from preceding page*)

it decreases again. In fact, if W is raised slightly above the value required to produce a displacement angle $\delta = 90°$ the system at once becomes unstable; the springs then suddenly go on stretching under the influence of this fixed load, and the whole system of levers falls out of balance. In other words, synchronism is lost.

The power limit of the mechanical system can be increased by using stronger springs, corresponding to decreased series reactances, X_g, X and X_m, in the electrical system; and by using longer lever arms, corresponding to higher transmission voltages [*Cf.* Eqn. (3)]. An alternative way of increasing the power limit is to insert a rigid mechanical prop between G and H, corresponding in the electrical system to the provision of an intermediate synchronous condenser station on a long transmission line. Mechanical models of the type illustrated in fig. 3 have, in fact, been successfully used to obtain quantitative as well as qualitative solutions of a number of power-transmission problems. (See note ‡, p. 954.) They afford a striking illustration of the close analogy which often obtains between mechanical and electrical engineering science.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Voltage Standardisation

MR. E. P. BURDETT, in your issue of June 16th, questioned my statement, which was in agreement with Mr. Romero's views, that there should be no great difficulty in changing from 220 or 240 V to the standard of 230 V. I had then chiefly in mind the lamps and appliances on consumers' premises, for it is the distributors' own fault if (at the least) their modern mains transformers and meters are not suitable for standard voltage for a considerable time has elapsed since the Electricity Commissioners first published their approval of 230 V as the standard for the country.

I do not think that many distribution engineers would have altered the size of their mains just for the small increase in current of less than five per cent. that would be caused by a reduction from 240 to 230 V, for they would be very happy men if they could foretell (particularly in residential areas) the ultimate load on their distributors within this narrow percentage.

As regards transformers, even if extra tappings have not been provided for the standard pressure of supply, the usual + and — 2½ and 5 per cent. tappings should enable a rise or fall of only 10 V to be made with little if any variation in the primary high voltage.

Bournemouth, *June 22nd.* B. S. HORNBY.

Wire Broadcasting

I suggest that the attention of the electrical industry be drawn to a situation which may gravely affect their interests both materially and ideologically.

In introducing the subject of wire broadcasting in the House of Commons recently, the Postmaster-General gave the impression that the best method of distributing programmes was via the telephone. It was suggested that the only alternative method was one in which new wires had to be erected, i.e., the audio-frequency method. No mention was made, in these introductory remarks, of the use of electric power mains for wire broadcasting.

Sir Herbert Williams called attention to the existence of a system invented and perfected by R. E. H. Carpenter and myself but referred to " grave technical difficulties " yet to be overcome. The Postmaster-General in summing-up said that the system had been tried in America and had failed; the implication of this is that the scheme while feasible is impracticable.

The way of the pioneer is hard and without any working system it is difficult to rebut criticisms of this kind, but I think it perfectly fair to say that, while obviously finality can never be achieved and while adaptations of method to meet varying conditions must always be necessary, there is absolutely no reason why to-day a practical and working system should not be set up in order to prove the feasibility of the method.

We, having a deep knowledge of our problems, can say with absolute assurance that we know of no 'grave technical difficulties" yet to be overcome, and we will in a short space of time be willing to give yet another demonstration to prove the justice of our contention. It is true that a similar scheme was tried in America and was not at the outset successful but what is not appreciated generally, and should be stated in fairness to American engineers, is that the system of American electrical distributing is much less well adapted than ours for mains broadcasting purposes.

The system hitherto used for programme rediffusion involves the transmission of audio-frequency currents, at a level suitable for the direct energisation of loud speakers, through new overhead wires draped over streets and housetops or cleated to house walls, having tee-offs into consumer's premises. The telephone system involves injecting high-frequency currents into subscribers' pairs and the subscriber gets his service by connecting an ordinary wireless receiving set to telephone terminals.

The "overhead wiring" or audio-frequency method disfigures our cities and towns; the difficulties in securing wayleaves prevents its application in the better residential areas; since it requires two new wires for every programme given, a multi-programme service is impracticable; and it is a retrograde step in any case to use new wires where an existing network will serve.

The telephone system suffers from none of these disadvantages but introduces new ones, as (a) the user must pay for the purchase and upkeep of a wireless set in addition to paying the Post Office for what is in effect an aerial which gives interference free reception on certain selected programmes; (b) the programmes selected are to be largely British which can be picked up easily in any case—there seems to be no proposal to relay commercial programmes; and (c) the telephone is installed in only one-fifth the number of houses which have electric wiring.

The mains system overcomes these disadvantages. A great deal of capital has been invested in mains cable and the system would add new and additional earning capacity for the capital thus spent.

London, W.C.2, *June 22nd.* P. P. ECKERSLEY.

Explanation Wanted

Might not the solution to " Puzzled's " problem be that the resistance to earth of the compo gas system with its soldered joints may be considerably less than that of a conduit system, not excluding screwed.

I had a somewhat similar experience some years ago in a hairdresser's establishment where a metal bracket, for a hair-dryer which was down to earth and had been hung up while switched on, had been fixed by some bright lad in such a position as to touch a compo gas pipe. Things looked quite nasty for a few moments until I applied a large hammer to the gas pipe.

Hitchin, *June 23rd.* C. M. KING.

As " Puzzled " is sure that the earth system in question is satisfactory, it appears that owing to accidental contact between the conduit and a gas pipe, two alternative paths to earth were available for the fault current, one by means of the proper earth system and the other through the compo gas-pipe.

The conduit would rise in potential for a fraction of time until the fuse cleared and during that period, in accordance with the theorem of divided circuits, current would flow in the two paths to earth with relative strengths proportional to their conductances. It would appear almost certain that this effect was the cause of the occurrence mentioned.

Exeter, *June 24th.* W. N. LAVIS.

An Indian Accident

The letter of " R. M. F." in your issue of June 23rd gives an interesting case of electric shock from voltage gradient. Animals standing at the base of transformer poles sometimes receive shocks in this way due to their hind and fore feet being in contact with points on the ground between which a difference of potential exists. Such conditions arise when there is an uncleared fault on the system and the neutral point earth electrode is not buried sufficiently deeply. The gradient is sometimes severe enough to be felt by a human being walking in the vicinity.

A similar situation no doubt existed when the overhead line fell into Husai Sagar Lake. The circuit was not cleared, current flowed through the water to earth, and a voltage gradient was set up in the vicinity of the wire. The gradient would be steepest near the wire, which might account for the death of " A " and the recovery of " R " who was further away. The effect of receiving a shock in this way would be exactly as described. The victim would be thrown about in the most vigorous manner by the contraction of his own muscles—every new position in the water causing a more or less violent reaction of various muscles depending on the position of the body with respect to the voltage gradient.

The large area of contact and the low resistance due to being in the water would result in the person being sensitive to very low voltages. The voltage of the line is not stated, but supposing it was only 230 V one could still be 3 or 4 yards away from the line and receive 20 V between head and feet if lying at right angles to the equipotential lines—such a voltage in such conditions would, I imagine, give a most unpleasant shock, and probably sufficient muscular reaction to throw a person violently into another position. If it was a high voltage line, then " R " was exceedingly fortunate not to lose his life. H. G. TAYLOR.

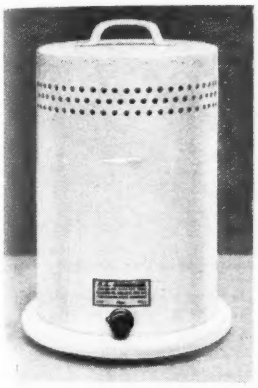
Harrow, *June 24th.*

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Small Ozoniser

A SMALL ozoniser for cold storage chambers is the latest product of BRUCE H. AULD & CO., LTD., 161, Stafford Road, Croydon.



Portable "S.A." Ozoniser

Owing to its oxidising properties ozone will effect complete deodorisation of cold storage chambers and prevent one article of food contaminating another. The new "S.A." portable ozoniser is designed particularly for this purpose.

The unit is compact and is housed in a stove-enamelled cylindrical steel case. The loading is 10 W (max.) for the type illustrated, which is suitable for a room of about 500 cu. ft.

Other types are available for large cold stores, either of the portable or fixed type. Convertors are available to operate the ozonisers on DC supplies, to obtain the necessary high voltage.

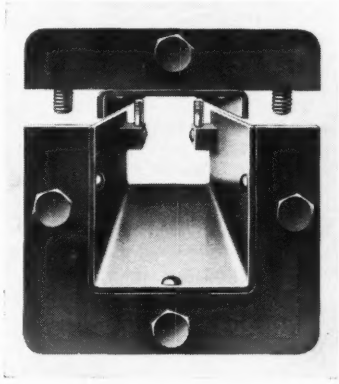
"Cleanline" Cookers

The Jackson Electric Stove Co. points out that the "Cleanline" cooker (ELEC. REV., June 16th, p. 882) has a "Zone" type thermometer only when a thermostat is incorporated, otherwise a thermometer graduated in degrees is fitted.

Distribution Troughing

A system of distribution troughing has been introduced recently by ELECTRO-MECHANICAL SUPPLIES, LTD., 44, Bagley Lane, Coventry.

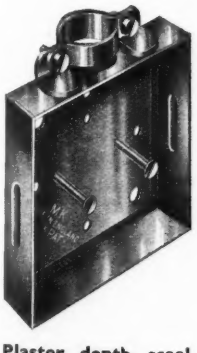
The troughing is 14 or 16 SWG (according to size) mild steel bent into a "U" shaped trough flanged at ends. The cover is similarly shaped but slightly smaller to allow it to be a push fit in the main troughing. The sizes of the troughing are 2 in. by 2 in., 4 in. by 2 in., and 6 in. by 2 in., weighing 14½ lb., 26½ lb., and 35¼ lb., respectively, per length of 8 ft.



End view of the 2-in. square troughing

The troughing can be fitted with bus-bars of any capacity up to 400-A four-wire; it can also be taken down and re-erected elsewhere while it is also possible to tap directly off the bus-bars to individual fuse units.

Shallow Steel Boxes for Switches



Plaster depth steel box with cleat for round conduit

A range of very shallow switch units fitted in a new kind of pressed-steel box is the latest development of M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.

The boxes are available in three types, one fitted with a rubber grommet where conduit is not used, another with a cleat to grip oval conduit securely, and another with a cleat for a round conduit. The steel boxes are considerably lighter than the cast-iron type previously used and all surfaces are consistently even and regular. The boxes are approximately ¼ in. deep so that there is no need to cut away the wall in ordinary house installations, as they are all plaster level depth.

The switch is the "Slot" type with a positive action, and the front plate is brown on white finish, with a matted surface. Prices compare favourably with other units; the grommet type of box costs but little more than a teak box. All steel boxes can, if specified, be fitted with levelling pillars, enabling quick and easy alignment to be obtained beween switch and switch-plate.

Portable Ironer

The Armstrong "Porta-lectric" ironer is now being handled in this country by MACGREGOR & MCCALLUM, LTD., 1, Newman Street, London, W.1, and the ACE ELECTRIC Co., Huddersfield.

"Porta-lectric" ironer

It comprises an 18-in. padded roller driven by an internally mounted motor. A lever operates a highly polished curved metal shield heated by a 900-W element. This bears against the rotary element on which the material to be ironed is laid.

The apparatus is suitable for AC supplies only, and weighs 26 lb.; an easily operated elbow switch controls the actual working of the ironer.

Domestic Washing-up Machine

In the description of the "Dreadnought" washing machine published last week the rating of the motor was given as 4 HP. This should, of course, have been ¼ HP.

Insulated Service Fuses

An addition to the range of "Isco" insulated service fuses made by W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1, is a 30- and 60-A four-pole type with combined sealing chamber. It incorporates all the features of the 30- and 60-A single- and double-pole combined "Isco" units and can be arranged for four fuses or three fuses and neutral. The fuses and neutral connector are interchangeable so that the fuses can be fitted on the right or left side.

Four entries—two vertically and two horizontally—are provided for the sealing chamber, and the fuse unit can be supplied as a three-pole, two-way double-pole or three-way double-pole outfit.

Mass-produced Electric Vehicle

To reduce the cost of production PARTRIDGE WILSON & CO., LTD., Davenset Works, Evington Valley Road, Leicester, have brought out a mass-produced vehicle known as the "Spaniel." It is sold only in fleets of six, complete with three-phase automatic group charging equipment.

The general design has been developed from the model "S.L.W.," and "Exide-Ironclad" batteries having 24 cells with a capacity of 161 Ah at a 5-hr. rate are fitted as standard. The controller is the Wilson drum type with an interlocking relay contactor; recent improvements in this include an easily detachable inspection cover, simplified withdrawal of the controller drum and increased power in reverse. A pedal foot control is fitted.

Wilson "Spaniel" vehicle

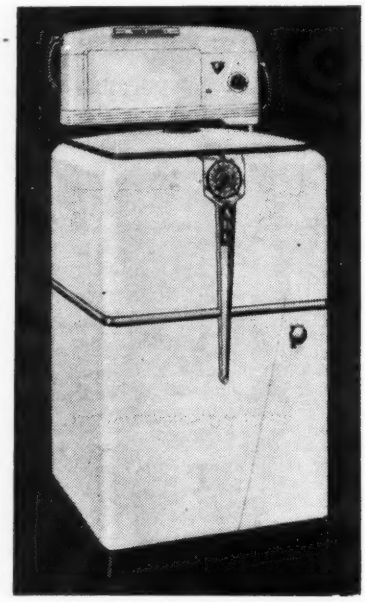
The motor is a forced draught ventilated drip-proof machine with Class B insulation and continuously rated. The ampère-hour meter is of a new type designed to overcome irregularities and "sticking" troubles.

The pay load is between 8 and 9 cwt. and the speed on the level, fully laden, is 14 to 16 MPH.

A Cabinet Washer

A modern cabinet washer which is being introduced into this country by SUNBEAM ELECTRICAL APPLIANCES, 462, Gallowgate, Glasgow, is the "ABC 400."

It has a capacity of 18 gallons of water and 8 lb. of clothes. Among the special features of this washer is the time control which enables the duration of washing to be set automatically, while finger-tip control on the side of the washer gives instantaneous stopping and starting.



"ABC 400" washer

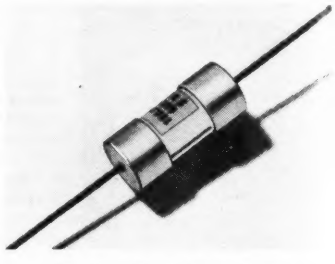
The sturdy "streamlined" wringer, which has 2¼ in. semi-balloon rollers, can be fixed in any of six positions, and a selector lever enables various pressures to be obtained. A touch-bar on top of the wringer serves as a safety release.

The cabinet has an attractive appearance and is electrically welded throughout. Rubber buffers support the tub and the motor is also rubber mounted.

The dimensions of the washer are 47 in. high by 21 in. wide by 21 in. deep and the finish is black and white.

High Rupturing Capacity Fuses

Small overall dimensions and wire tails to make them suitable for use with practically any make of carrier for high-rupturing capacity fuses are features of new cartridge fuses being marketed by LAWSON BECK, LTD., Queensway, Team Valley Trading Estate, Gateshead-on-Tyne, 11. They can also be used with a number of semi-enclosed carriers, making it unnecessary to replace the fuse carrier to suit the cartridge.



Lawson Beck h.r.c. fuse

The fuses are made for circuits up to 30 A at 660 V AC, and comply with B.S.S. No. 88, 1939. They have been certified by an independent testing authority for category of duty 440 AC3, and the time lag element is designed to withstand motor starting conditions, enabling the fuse to be marked with the horse-power of the motor for which it may be used.

A totally enclosed "non-explosive" indicator is fitted to prevent danger of fire or of failure of the cartridge due to a flash-over between the caps.

A Wharf Lift Installation

Complete Safety Assured

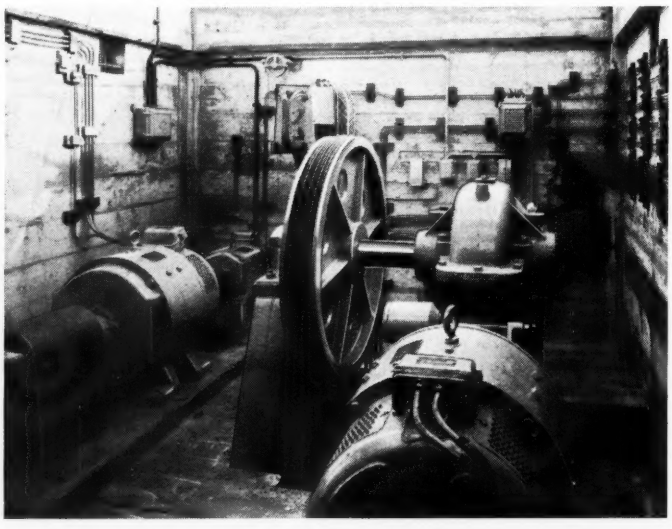
IN this age of lifts a new installation causes little interest, but a lift recently completed at Symons Wharf, Tooley Street, London, is worthy of special note on account of unusual, but very sound, features incorporated in it.

Installed by Bennie Lifts, Ltd., for the Engineering Department of The Proprietors of Hay's Wharf, Ltd., this lift has a rating of 1 ton at 250 ft. per minute. Car-switch control is employed, and two speeds are available at the option of the driver.

The generator and exciter are driven by a three-phase, 400-V squirrel-cage motor, started by a push button which actuates an automatic star-delta controller incorporating phase-failure protection, so that, in the event of any one phase failing, the generator will be immediately stopped and cannot be started again until all three phases are "alive." The generator is continuously rated, thus allowing it to run all day when the lift is in constant use. Acceleration and deceleration of the lift are governed by reactance-controlled resistance steps, which give exceptionally smooth starting and stopping.

All the control gear is in a sheet-steel fireproof cubicle case mounted on an insulated base and fitted with an interlocked isolator switch, thus making it necessary for the current to be switched off before adjustments can be made to the panel, so ensuring safety. Precautions have been taken throughout the construction to prevent radio interference.

The electrical wiring of the job, very well shown in the illustration, is carried out in single-core lead-covered cable supported in ash cleats, and is therefore open to inspection throughout its length. In this way faults can be readily detected and damaged wiring easily and promptly replaced and the installation itself is its own "circuit diagram."



Lift installation at a London wharf with guards removed

The car is of exceptionally heavy construction, being specially designed for the unusually severe conditions experienced by the owners, who declare that a lift car of the "normal competitive type of construction" would be worn out and have to be replaced, in a very few years.

Safety gear is of the scissors type, operating in conjunction with a speed governor which is arranged to bring into operation the safety gear if overspeeding of the lift occurs. This over-speed governor functions through two stages, first by reducing the car speed to slow and, secondly, if over-speeding still continues, by cutting off the current to the motor and bringing into operation the scissors type of safety gear. In addition, a Wylie safe load indicator is so incorporated that if the rated load of 1 ton in the car is exceeded by as little as 2 cwt. the lift will refuse to function and an electric bell will ring continuously until the excess load is removed.

The safety of maintenance staff working on the lift is assured by the provision of switches on top of the car and in the pit, the operation of which prevents the lift engine being started; in addition to this, all moving parts in the motor room are completely guarded. The provision of a socket for a hand inspection lamp on the car roof is both novel and extremely useful.

All the gates are of the steel shutter type with inspection window and, in case of fire or other cause requiring emergency access to the well from any floor, a special lock release mechanism is provided.

The liberal manner in which the specification of the chief engineer of Messrs. Hay's Wharf has been interpreted has resulted in the makers being given an order for two more heavy goods lifts and a passenger lift to a similar specification.

AMERICAN ELECTRICAL EXPORTS

Outstanding Markets

FULL details are now available in the annual statement of the foreign trade of the United States for 1937, of the markets to which the various kinds of American electrical goods are exported. There is not space here to give the figures for more than a selection, but in the accompanying statement an attempt has been made to include the more outstanding or noteworthy items and outlets.

The recovery in the electrical export trade as a whole, which began in 1933, continued, and the grand total for 1937 was $112,609,000, compared with $91,345,000 in the preceding year, and well over twice the 1933 total. Few groups failed to participate in the advance, and the statistics afford ample evidence of American keenness in taking advantage of every opportunity, particularly in the Latin American countries, and also in the Empire. Canada's share remained large.

Progress in relatively new lines, such as radio apparatus, refrigerators, and washing machines, was especially marked.

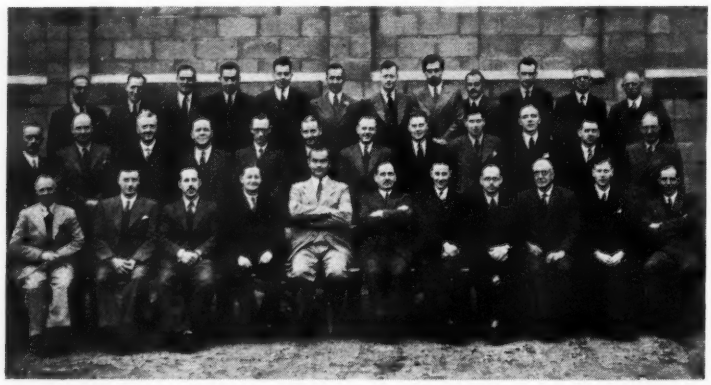
The figures of total trade (without specifying destinations) available for 1938 show a setback, the exports of electrical machinery and apparatus being valued at $102,151,000.

	1937 $ (000)	Inc. or dec. on 1936 $ (000)
Generators, DC—		
Total	512	+ 167
To Canada	120	+ 82
,, Mexico	43	+ 17
,, Brazil	11	− 51
,, Colombia	19	+ 11
,, South Africa	28	− 5
,, India	41	+ 40
,, Japan	22	+ 13
Generators, AC, under 2,000 kVA—		
Total	390	+ 144
To Mexico	44	—
,, Venezuela	51	+ 37
,, Canada	54	+ 26
,, Philippines	100	+ 54
Generators, AC, 2,000 kVA and over—		
Total	716	+ 600
To Mexico	118	+ 118
,, Newfoundland	130	+ 130
,, Soviet Russia	199	+ 187
,, Brazil	142	+ 142
Steam turbine generator sets—		
Total	334	+ 79
To Canada	62	+ 44
,, Chile	191	+ 189
Accessories and parts for generators—		
Total	589	− 78
To Canada	114	+ 9
,, Chile	128	+ 112
Arc welding sets—		
Total	1,060	+ 340
To Mexico	135	+ 55
,, Canada	176	+ 70
,, Iran	81	+ 49
,, United Kingdom	196	+ 111
Self-contained lighting outfits—		
Total	1,761	+ 1,111
To Japan	119	+ 113
,, South Africa	246	+ 161
,, Venezuela	104	+ 49
,, Canada	104	+ 18
,, Argentina	247	+ 210
Batteries, 6- and 12-V storage—		
Total	1,829	+ 606
To South Africa	332	+ 135
,, Holland	69	− 6
,, India	195	+ 71
,, Mozambique	62	+ 22
,, Venezuela	69	+ 20
Other storage batteries—		
Total	1,010	+ 415
To Argentina	28	− 227
,, Canada	69	− 7
,, Mexico	69	+ 1
,, South Africa	273	+ 153
,, Chile	194	+ 118
No. 6 dry-cell batteries—		
Total	229	+ 33
To Argentina	63	+ 9
,, Newfoundland	19	+ 1
Flashlight batteries—		
Total	2,813	+ 513
To Argentina	253	+ 69
,, Colombia	212	+ 19
,, India	825	+ 82
,, Malaya	213	+ 16
,, Siam	132	− 8
,, South Africa	141	− 4
Radio B & C dry batteries—		
Total	511	+ 59
To Argentina	251	+ 38
,, South Africa	45	− 4
Other wet and dry primary batteries—		
Total	189	+ 52
To Canada	22	+ 5
,, South Africa	33	+ 11
Power transformers, 500 kVA and over—		
Total	437	+ 74
To Brazil	219	+ 119
,, Chile	83	+ 79
Distribution transformers, less than 500 kVA—		
Total	649	+ 217
To Mexico	119	+ 79
,, Venezuela	103	+ 66
,, Colombia	52	− 19
Instrument transformers—		
Total	122	− 25
To South Africa	18	+ 1
,, Brazil	18	− 12
,, Mexico	20	+ 2
Other transformers—		
Total	422	+ 30
To Canada	67	+ 33
,, Mexico	74	+ 4
,, S. Africa	54	+ 30
Double current and motor generators, convertors, etc.—		
Total	686	+ 157
To Canada	88	+ 9
,, Soviet Russia	51	− 38
,, United Kingdom	71	+ 39
Switchboard panels, except telephone—		
Total	560	+ 120
To Canada	60	+ 23
,, Venezuela	53	+ 50
,, Mexico	16	+ 44
Power switches and circuit breakers over 10 A—		
Total	1,492	+ 365
To Canada	350	+ 99
,, Mexico	170	+ 70
,, South Africa	138	+ 53
,, Brazil	196	+ 50
Watt-hour and other measuring meters—		
Total	772	+ 326
To Mexico	110	+ 52
,, Cuba	100	+ 53
,, Philippines	81	+ 34
Indicating instruments—		
Total	808	+ 275
To United Kingdom	100	+ 34
,, Italy	99	+ 27
,, Canada	171	+ 69
Recording instruments—		
Total	341	+ 67
To United Kingdom	36	+ 2
,, Canada	50	+ 25
Other testing apparatus—		
Total	1,227	+ 278
To Canada	458	+ 94
,, United Kingdom	113	− 7
,, Australia	92	+ 43
Lightning arrestors, choke coils, etc.—		
Total	640	+ 188
To South Africa	28	− 19
,, India	67	+ 9
,, Canada	113	+ 59
,, Australia	56	+ 24
Motors, ½ h.p. and under—		
Total	881	+ 202
To United Kingdom	97	+ 7
,, Canada	309	+ 61
Motors, over ½ h.p. and under 1 h.p.—		
Total	345	+ 49
To Argentina	38	− 56
,, Canada	100	+ 37
Stationary motors, 1–200 h.p.—		
Total	1,839	+ 489
To Canada	273	+ 146
,, Mexico	262	+ 130
,, South Africa	129	+ 7
,, Argentina	85	− 32
,, Brazil	164	+ 100
Stationary motors, over 200 h.p.—		
Total	283	+ 167
To South Africa	48	+ 15
,, Chile	45	+ 37
Railway motors—		
Total	305	+ 165
To South Africa	248	+ 166
Elec. locomotives, railway—		
Total	113	− 1
Elec. locomotives, mining and industrial—		
Total	687	+ 258
To Canada	120	+ 53
,, South Africa	62	+ 14
,, Mozambique	100	+ 27
,, Mexico	67	+ 30
Electric trucks—		
Total	260	+ 98
Starting and controlling equipment for railway and vehicle motors—		
Total	264	− 487
To South Africa	108	− 478
Ditto, for industrial motors—		
Total	1,545	+ 383
To Canada	571	+ 178
,, Mexico	137	+ 58
,, South Africa	48	− 7
,, Soviet Russia	97	+ 11
,, United Kingdom	163	+ 81
Portable electric tools—		
Total	1,232	+ 322
To United Kingdom	275	+ 21
,, Canada	286	+ 135
Accessories and parts for motors—		
Total	1,033	+ 273
To Canada	493	+ 62
Household refrigerators—		
Total	12,755	+ 987
To France	750	+ 170
,, United Kingdom	790	− 1,266
,, South Africa	2,342	+ 501
,, Mexico	589	+ 174
,, Brazil	995	+ 101
,, Canada	1,044	+ 365
Commercial refrigerators—		
Total	2,484	+ 250
To United Kingdom	558	+ 162
,, France	222	− 44
,, South Africa	110	− 58
,, Argentina	138	+ 98
Electric fans—		
Total	622	+ 74
To Canada	120	+ 17
Incandescent lamps for automobiles, flashlamps, etc.—		
Total	449	+ 92
To India	115	+ 23
Other metal filament lamps—		
Total	1,050	+ 224
To Argentina	114	− 12
Other electric lamps—		
Total	49	− 92
To Canada	10	− 26
Household washing machines—		
Total	2,101	+ 1,035
To Canada	505	+ 248
,, United Kingdom	502	+ 323
Domestic vacuum cleaners—		
Total	529	+ 20
To Canada	104	+ 50
,, United Kingdom	239	+ 11
Flat-irons—		
Total	342	+ 117
To Argentina	60	+ 18
Cooking ranges—		
Total	400	+ 35
To South Africa	91	− 12
,, Mexico	54	− 27
Electric furnaces, etc.—		
Total	836	+ 217
To Soviet Russia	153	+ 31
X-Ray apparatus, etc.—		
Total	1,326	− 148
To Canada	276	− 126
,, Mexico	100	− 12
,, United Kingdom	174	+ 1
Radio transmitting sets, valves and parts—		
Total	2,684	+ 867
To Mexico	196	+ 67
,, Argentina	257	+ 183
,, Canada	256	+ 157
,, Soviet Russia	199	+ 97
,, Philippine Islands	152	+ 56
,, France	149	+ 99
Receiving valves—		
Total	4,064	+ 550
To France	225	− 25
,, Sweden	247	+ 86
,, Canada	275	+ 11
,, Argentina	704	+ 178
,, Belgium	434	+ 42
,, United Kingdom	206	− 149
,, Soviet Russia	215	+ 177
Receiving sets—		
Total	16,129	+ 88
To Belgium	1,242	+ 21
,, France	358	− 182
,, Portugal	333	+ 28
,, United Kingdom	1,159	− 311
,, Mexico	2,385	+ 299
,, Brazil	1,782	+ 364
,, South Africa	1,944	− 73
,, Venezuela	496	+ 109
Receiving set components—		
Total	7,463	+ 1,803
To Argentina	1,357	+ 603
,, Canada	1,435	+ 79
Loudspeakers—		
Total	888	+ 182
To Canada	275	+ 57
,, Sweden	106	+ 1
Other receiving set accessories—		
Total	881	+ 341
To Canada	109	+ 10
,, Soviet Russia	261	+ 254
Electric clocks—		
Total	437	+ 137
To Canada	124	+ 16
,, United Kingdom	113	+ 53
Telegraph apparatus—		
Total	503	+ 276
To Canada	197	+ 118
,, Soviet Russia	66	+ 21
,, Holland	61	+ 61
Telephone instruments—		
Total	261	+ 75
To Philippines	99	+ 66
Other telephone equipment—		
Total	3,021	+ 1,180
To Canada	1,107	+ 586
,, Brazil	421	+ 128
,, Australia	322	+ 80
Starting, lighting and ignition equipment (except spark plugs)—		
Total	1,437	+ 120
To Canada	388	+ 47
Insulating material—		
Total	412	+ 65
Metal conduit and switchboxes—		
Total	1,083	+ 458
To Brazil	146	+ 59
,, Mexico	127	+ 77
,, Canada	131	+ 35
Lighting switches, sockets, etc.—		
Total	1,021	+ 246
To Mexico	76	+ 10
,, Canada	253	+ 72
,, United Kingdom	82	+ 19

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE employees of Micanite & Insulators Co., Ltd., spent an enjoyable afternoon in brilliant weather on June 10th, when the Sports and Social Club held their annual athletic sports meeting at Blackhorse Lane, Walthamstow, in the presence of about a thousand spectators. The programme included thirty-eight events, and Mrs. Stanley M. Mohr, wife of the managing director, presented the seventy prizes as well as three championship cups, which were, as usual, the objects of keen friendly rivalry.



Representatives and head office executives at the Bull Motors sales conference

Mr. H. Burroughes has resigned from the chairmanship and the board of Ensign Lamps, Ltd., owing to his time being fully occupied with Government work on rearmament schemes. **Mr. G. W. Fletcher,** a director of Prices Trust Co., Ltd., has been elected a director and chairman of the company.

Mr. R. A. Jago, A.M.I.E.E., contract manager of the J. L. Eve Construction Co., Ltd., was married on June 16th to Dr. Eileen Gertrude Marshall, daughter of Mr. A. H. W. Marshall, M.I.E.E., formerly of the North-Eastern Electric Supply Co., Ltd.

Mr. J. W. Logan, who is attached to the Glasgow branch of the General Electric Co., Ltd., has for the third successive year been selected by the Scottish Bowling Association as a member of the team to represent Scotland in the international matches against England, Ireland and Wales to be played in London next month.

Croydon Corporation Electricity Committee reports that **Mr. E. Thorpe,** control engineer, has accepted a position as control engineer with the County of London Electric Supply Co., Ltd., at the Littlebrook power station. **Mr. R. J. Holley,** assistant control engineer, Lancashire Electric Power Co., has been appointed to succeed Mr. Thorpe at Croydon.

Loughborough College has made the following awards for 1939 of British Empire scholarships (tenable in the Faculty of Engineering):—Open: Mr. R. R. Beaumont (Royal Grammar School, Worcester); Mr. D. T. Owen (County School, Cardigan); Mr. I. M. Thomas (Brynrefail County School, Cwm-y-Glo); Mr. J. C. Wells (Holme Valley Grammar School, Holmfirth). Reserved for Rhodesia: Mr. P. G. Wright (Rondesboch Boys' High School, Cape Province). Reserved for the College School: Messrs. J. B. Park and A. J. Wale.

Mr. J. Howie, London manager of Glenfield & Kennedy, Ltd., is retiring this month after fifty-two years' service with the company. His successor is **Mr. J. Mair,** B.Sc., A.M.I.Mech.E., who for the past sixteen years has acted as chief engineer to the company in India.

Outstanding features of the Dagenham Cables Sports Club annual fête and gala held at the sports ground on June 17th, were an auxiliary fire service and A.R.P. display and a pageant of youth and beauty. Methods of dealing with various types of fire and with incendiary bombs were displayed by the company's auxiliary fire brigade, and members of the ladies physical training class were included in the pageant of youth and beauty staged by Miss Eileen Fowler. Among the large crowd which attended were Mr. and Mrs. J. Snow Huddleston, and Mr. and Mrs. C. Pipkin. In addition to track and field sports events, there were various side shows, horticultural and cake baking exhibitions, Punch and Judy shows, and a large number of special events for children in the children's playground attached to the ground.

The nineteenth annual outing of McKechnie Bros., Ltd., held last Saturday, was attended by a large number of the personnel of the Birmingham works. The function consisted of a tour of Warwickshire as far as Stratford and then on to Oxford. Here the party divided, some choosing to go to Abingdon by steamer, others continuing by road. Despite the inclement weather a most enjoyable day was spent.

At the annual meeting of the cable makers' football cup competition organisers, **Mr. T. G. Spencer** (chairman, C.M.A.) was elected president, and Mr. E. C. Griffiths (chairman) and Mr. H. H. Sirett (hon. secretary and treasurer) were re-elected. Mr. J. Lapthorne took the place of Mr. W. F. Smith as deputy chairman. The final was fixed for March 30th, with the match at Woolwich and dinner at the London Tavern, Fenchurch Street. The draw for the first round is: Clyde v. Pirelli-General and Johnson and Phillips v. Standard, other teams having byes.

The staff of the Lothians Electric Power Co. visited St. Andrews last week for their annual outing. The weather, though hardly at its brightest, in no way marred the enjoyment or affected the success of the visit. The morning was spent playing golf or tennis, swimming, &c., a sports meeting being arranged for the afternoon.

The annual conference of the sales staff of Bull Motors was held last Friday, June 23rd, simultaneously with a similar conference of the sales staff of the associated company, E. R. & F. Turner, Ltd. The conference was followed in the evening by the annual dinner of the combined sales staffs at the Orwell Hotel, Felixstowe. The following morning was spent in inspecting the new works and offices which have now been completed, and the annual works sports were held in the afternoon.

Mr. H. M. Speirs (president of the Electrical Contractors' Association of Scotland), 71, Berkeley Street, Charing Cross, Glasgow, C.3 (telephone: Douglas 3493), has been appointed representative of Bennie Lifts, Ltd., for the whole of Scotland. He has made arrangements to deal with any emergency or breakdown occurring during the day, night or holiday period.

The annual sports of the Callender Athletic and Social Club held at Belvedere on June 24th were well up to the high standard set in previous years, despite unfavourable conditions. For the first time cycle races were included, with one mile and half-mile open events. Callender's Senior Band played during the afternoon. An inspection of the works fire brigade and auxiliary fire services was made by Mr. T. O. Callender and Major-Gen. Sir F. Sykes. The sports prizes were presented by Mrs. T. O. Callender. At supper in the evening Mr. T. O. Callender presided, supported by Mr. W. F. Slater and Mr. H. Hill (joint works managers).

A cruise in Northern waters has been chosen for their honeymoon by **Mr. K. G. Forby,** A.M.I.E.E., district mains engineer to the Nottingham Corporation Electricity Department, and **Miss Ellen Nessey Moore,** who until her wedding was a demonstrator at the Nottingham electricity showrooms. They were married at St. Jude's Church, Mapperley, Nottingham, on June 21st. The bride's father, Mr. W. Moore, M.I.E.E., is mains engineer to the Nottingham Corporation Electricity Department, and Mr. H. Margary, M.A., an assistant mains engineer, was best man.

Mr. and Mrs. K. G. Forby

Mr. M. A. Jane, A.M.I.Mech.E., has been appointed to take charge of the new Birmingham office of the British Thermostat Co., Ltd., at Essex House, 27, Temple Street, Birmingham, 2. Mr. Jane has been with the company at Sunbury-on-Thames for many years. The Birmingham office will be able to handle direct all Midland inquiries for automatic control equipment, and will also be the headquarters of the company's Midland service engineer.

Mr. Ernest Taylor, B.Sc., A.M.I.E.E., was married last Saturday to Miss Georgina Elizabeth Michie, of Bedford. Mr. Taylor is a senior technical assistant on the staff of the Central Electricity Board (South-East England District). A large gathering, amongst whom were many of his colleagues of the Board's staff, assembled afterwards at a reception held in the Nelson Room at Ealing Town Hall.

Mr. E. Russ, recently of the British Thomson-Houston Co.'s street lighting department, has joined Concrete Utilities, Ltd., as sales manager. He has had sixteen years' experience in the electrical industry and before serving with the B.T.H. Co. held appointments with the Metropolitan-Vickers Electrical Co., Ltd., and Philips Lamps, Ltd.

OBITUARY

Mr. A. C. Hands, founder and senior partner of Albert C. Hands & Sons, died suddenly on June 22nd. Having established the firm in 1892, Mr. Hands could claim to have been one of the original wholesalers and manufacturers of electrical apparatus in this country. The business will be continued as formerly by the remaining partners.

Mr. F. J. Cooper.—The death occurred at Leigh-on-Sea on June 18th, of Mr. Frederick James Cooper, who for thirty-six years was in the Electricity Department of the Glasgow Corporation, retiring in June, 1928. He was seventy-eight.

Mr. H. M. Long.—We regret to report the death of Mr. H. M. Long, a director of the Westmorland & District Electricity Supply Co., Ltd., a subsidiary of Johnson & Phillips, Ltd.

Mr. G. M. Maddock.—We regret to announce the death on June 16th of Mr. G. M. Maddock, M.I.E.E., of the technical staff of the Power Equipment Co., Ltd., and till last year assistant staff engineer of the Post Office Engineering Department, where his service extended over a period of twenty-seven years. He was previously on the engineering staff of the National Telephone Co., Ltd.

Dr. H. F. Haworth.—The death occurred on June 18th, at the age of fifty-six, of Dr. Harold F. Haworth, Ph.D., M.Sc., B.Eng., M.I.E.E., outside technical representative of Leyland Motors, Ltd. Educated at Liverpool and Zurich Universities, he held appointments on the staffs of the City and Guilds College and the Imperial College of Science and Technology, South Kensington. From 1929 to 1933 he was chief engineer to Leyland Motors, and at the time of his death he was, in addition to other work, supervising the design and sales of both trolley-buses and railcars.

Mr. F. M. Long.—The death has occurred at Gainford, near Darlington, of Mr. F. M. Long, who for forty years until his retirement in 1932 was head of the Norwich electricity undertaking. He was originally the engineer in charge of the erection of the Duke Street works at a time when the undertaking was a private enterprise, and it was during his long appointment as city electrical engineer, after the undertaking had been acquired by the Corporation, that it developed to the extent of requiring the modern power station at Thorpe. Mr. Long was responsible for the introduction of the "free" wiring system in Norwich and also the "Norwich" system of charging consumers on a fixed tariff based on house assessment, plus a small charge per kWh.

[Lafayette
The Late Mr. F. M. Long

Mr. E. E. Benham, M.I.E.E., who left England for South Africa two years ago on retiring from the service of the Admiralty, died suddenly on June 9th at a meeting of the Cape Town Branch of the Kipling Society which he founded immediately on his arrival in Cape Town.

Mr. J. C. Smith, president of the Shawinigan Falls Water and Power Co., died last Saturday in Montreal at the age of sixty.

Wills.—Sir William Thom, formerly chairman of Yates & Thom, left £110,958 with net personalty £108,678.

Mr. H. H. Berry, chairman and managing director of Berry's Electric, Ltd., left £46,306, with net personalty £29,937.

Mr. E. P. Cumberbatch, M.B., M.R.C.P., the well-known electro-medical specialist, left £13,274, with net personalty £10,025.

Mr. Harry Lucas, chairman of Joseph Lucas, Ltd., left £151,679, with net personalty £144,490.

Mr. William Crawford, chairman of "Z" Electric Lamps & Supplies Co., Ltd., left estate of the gross value of £5,024, with net personalty £3,498. He left £100 to the Electrical Industries Benevolent Association.

Municipal Transport Conference at Brighton

BRIGHTON entertained well the delegates to the annual conference of the Municipal Passenger Transport Association, who held their annual conference in the town last week. In addition to its capacity for entertainment, the town was able to show the results of the recent change of the town's transport, in which the tramcars have practically all disappeared, trolley-buses having replaced them. The chairman of the Transport Committee (Councillor Eric Simms), who entertained the delegates at a reception one evening, has been very energetic in that direction, and the Mayor (Councillor J. Talbot Nanson), who accorded the delegates a civic reception when the conference was opened in the Royal Pavilion on June 21st (where facilities were afforded for the meeting by the Corporation), also entertained the visitors at a reception during the same evening.

Mr. J. M. Calder (manager and engineer of the Reading transport undertaking), the retiring president, commented in his address upon the progress of the industry.

Striking a controversial note, he pointed out that the responsibility of deciding future policy had been divided in some cases between the body directly responsible and another body whose doubtful qualification was opinion rather than knowledge. Suggestions made by a transport manager, supported as they must be by years of experience, by technical training, and other special qualifications, should not be lightly put aside. A manager's reputation was at stake when he submitted proposals to his committee. It should be the duty of a transport committee to formulate policy which it was the job of the transport manager to apply.

The formation of Joint Transport Boards, he said, would be complicated by the varying financial circumstances of each individual undertaking in a proposed group. An easier alternative would be the fixing of inter-running agreements which, generally speaking, had proved of mutual benefit to the undertakings concerned. Many must view with some concern the recent findings in a Traffic Commissioners' Court, when the right of a municipality to maintain its services under statutory conditions was questioned. He understood that the injured municipality had appealed against the Commissioners' decision. The case was of the greatest moment to municipal transport generally, the position of which must at all costs be defended.

The officers of the Association for 1939-40 were elected at the annual business meeting as follows: President: Alderman George Hill (chairman, Burton-on-Trent Corporation Transport Committee); vice-president: Mr. Clement Jackson (general manager and engineer, Plymouth Corporation Transport Department); hon. treasurer (re-elected): Mr. R. Stuart Pilcher (general manager, Manchester Corporation Transport Department); hon. solicitor (re-elected): Sir Frank Wiltshire (Town Clerk, Birmingham); and auditor (re-elected): Mr. H. Moxon (chief accountant, Leeds City Transport Department).

Mr. C. Owen Silvers (general manager and engineer, Wolverhampton Corporation Transport Dept., and a past-president of the Association) contributed a paper on "The Growing Problem of Workmen's Fares and Other Fare Concessions," with which subject the Council of the Association, he said, had been concerned for some time past. There was a good discussion on the paper, to which both councillors and managers contributed.

On the second day a discussion was opened by Mr. Ronald A. Fearnley (general manager, Coventry Corporation Transport) on the organisation of a transport department in national emergency for continuing the regular conveyance of passengers so far as conditions permitted and for providing emergency transport for A.R.P. purposes.

In the discussion Mr. F. Lythgoe (general manager of the Middlesbrough undertaking) referred to the spraying of vehicle windows with a blue cellulose paint and spraying the interior lighting bulbs amber. Passengers in the vehicles during daytime could see through the windows perfectly well, but at night one could not see any light from the outside. It seemed to be a very cheap method of obscuring light.

At the annual dinner Councillor Eric Simms said that his presentation of the accounts of the tramway undertaking for the last time was a mixed pleasure, because for thirty consecutive years the undertaking had shown a profit. It was absolutely out of debt, it had reservations of £45,000, and had paid more than £56,000 to the rates during the past twelve years uniformly, and all on a 2d. maximum fare. That reflected great credit on the late manager, Mr. "Bill" Marsh (who was present at the dinner). Whereas seven months ago orders had not been placed for the new trolley vehicles, they were already operating, and only nine tramcars remained.

COMMERCIAL AND INDUSTRIAL NEWS

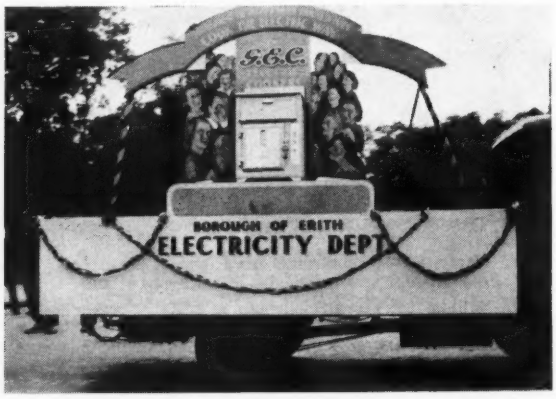
The "Co-op" makes lamps. Exide Convention. Large Floating Dock. New Cable Drum Carrier. A.R.P. Emergency Lighting

Wages in the Cable-making Industry

AT a meeting of the Joint Industrial Council for the Electrical Cable-making Industry on June 21st, it was decided to advance the wages of time workers—males, females and juveniles—by one step in the cost-of-living sliding scale, to come into force on the third pay day in July. The new scale is as follows:—Male timeworkers (21 years of age and over): Varying from 56s. 9½d. to 64s. 7½d. in district 1, and from 51s. to 59s. in district 2. Youths and boys (under 21 years): From 15s. 2d. to 47s. 6d. in district 1, and from 14s. 6d. to 44s. in district 2. Famales, districts 1 and 2: From 14s. 6d. to 19s. for girls 14 to 17 years of age, and from 29s. 6d. to 33s. 6d. for women 18 years of age and over. The scales for females do not include any service bonus that may be due.

A Carnival Tableau

The accompanying illustration shows a decorated vehicle which was entered for the recent local hospital carnival by



A decorated vehicle entered by Erith Electricity Department in the local hospital carnival

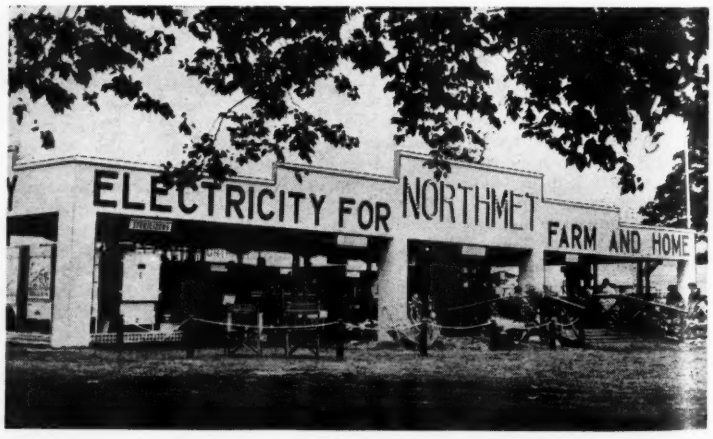
the Erith Corporation Electricity Department, with the co-operation of the General Electric Co., Ltd. The display attracted considerable attention and no doubt helped to further the progress of the electric cooking idea in Erith.

Swansea Appointment

The Swansea Corporation has decided to appoint a chief technical assistant at an initial salary of £682 7s., rising to £727 6s. per annum. At the Council meeting it was pointed out that the station would be classified under Class J of the N.J.B. Schedule on the completion of the installation of the new turbo-generator and it was further pointed out that it was essential that an engineer of suitable age and experience should be appointed so that he could be trained eventually to deputise for the chief electrical engineer. Details of the appointment appear in our advertisement pages.

Great Hertfordshire Show

As usual the Northmet Power Co. was well represented at the Great Hertfordshire Agricultural Show at Hatfield Park last Wednesday and Thursday. The stand was in a prominent position in the centre of the ground and there was a large array of equipment for the home and the farm. Much of the latter was connected up for demonstration. The appearance of the exhibit was enhanced by a garden at the front decorated with two electric fountains. Official luncheons were held on both days.



Northmet Company's stand at the Great Hertfordshire Show

E.A.W. at Sussex Show

For the first time Sussex members of the Electrical Association for Women held a rally at the County Agricultural Show at Eastbourne recently. Mrs. B. Swire gave a talk on "The Countrywoman and the E.A.W.," and as a countrywoman herself she spoke feelingly of the benefits of an electricity supply, dwelling particularly on water pumping and the uses of electricity in horticulture.

Co-operative Society Makes Lamps

Production at Britain's first Co-operative electric lamp factory, adjoining the S.C.W.S. factories at Shieldhall, Glasgow, commenced in January and already the output is 4,000 lamps per day. The official opening of the factory will not take place until August, but sufficient stocks have now been built up to permit marketing to be commenced. The range of lamps is at present confined to simplified lines ranging from 15 to 200 W in all general voltages, but other types will be added soon. Prices at which these lamps will be sold will be as defined by E.L.M.A., but special discount terms are permissible to retail co-operative societies and C.W.S. distributors. The factory is situated within a few hundred yards of the new industrial estate at Hillington, and is jointly owned and controlled by the Scottish and Swedish Wholesale Federation. It is thus the first international co-operative society factory to be opened in this country with a non-British society as one of the partners.

Amplifiers at Kenilworth Castle Pageant

The British Thomson-Houston Co., Ltd., has obtained the order for sound amplifying apparatus at the Kenilworth Castle Pagent, which is to be held from July 8th to 15th. As it is desirable to conceal the microphones and speakers as much as possible, eight moving-coil microphones are mounted on stands about a foot high distributed around the arena, while eight projector-type speakers are also on the ground arranged in a semi-circle facing the grand stand, all the units being screened by bushes and shrubs. The use of a volume contraction circuit keeps the volume of sound constant although the performers are moving about at a considerable distance from the microphone. Two-way communication between a control tower on top of the stand and three key positions round the arena is provided by an Ediswan "Loudspeakerphone," while a separate amplifier, microphone, and horn speaker are being used by the pageant master for prompting purposes. The pageant master's control desk contains the master unit of the "Loudspeakerphone," prompt microphone, microphone mixer, and "cue" light control unit.

"Exide" Convention

This year the annual convention of "Exide" service agents organised by the Chloride Electrical Storage Co., Ltd., was held at Bournemouth. The proceedings commenced on the evening of June 20th with the reception of the delegates (who included many from overseas) and an informal dance. On the following morning the Mayor of Bournemouth extended a civic welcome. Mr. D. P. Dunne, managing director, formally declared the convention open and installed Mr. C. J. B. Barlow, Warrington, as chairman. After lunch there was a motor tour of the district while a number of delegates competed for various prizes at the Parkstone Golf Course. A dinner and dance was arranged for the evening and during an interlude three members of the company's staff discussed various battery service problems. On June 22nd the morning and afternoon were devoted to the discussion of various matters and the annual banquet took place at the Pavilion (where all the sessions were held) in the evening. As usual, the affair was a merry one and was further enlivened by a number of ingenious Exide "stunts." The conference concluded on Friday, June 23rd, when Mr. Barlow and Mr. H. V. Schofield, sales manager, summed up the three days' proceedings.

During the convention an exhibition of "Exide" and "Drydex" products was arranged at the Pavilion. Particularly noteworthy were a compact h.t. and l.t. unit for stratosphere balloons; dry-charged "A.R.P." batteries for emergency lighting in family shelters; the "Non-Flud" filling device which prevents the overflowing of water when topping-

up batteries; "linkless" battery repair equipment; and the "Exide" service bench for repair work.

E.D.A. Activities

The success of the E.D.A. carnival car has been such that the Association has decided to produce a duplicate car in order that more members may have the opportunity of utilising this attractive feature. The national electric cooking campaign is now in full swing and July sales and publicity programme of the Association contains a price list of material available to link up with the campaign, such as booklets and folders, posters, window display, and advertisement stereos. Members are also reminded of advertising novelties issued by the Association, which include "I'm Electric" dolls, handbag mirrors, book matches, whist and bowls score cards and bookmarks. The summer number of "Electrical Housekeeping" is now available.

Sodium Lighting in a Factory

In the heart of the Leicestershire countryside, near Potters Marsden, is a newly erected factory belonging to John Ellis & Sons, Ltd., for the manufacture of spun concrete pipes. Before the type of lighting was finally chosen, extensive tests with both mercury and sodium lamps were carried out at the company's other works at Barrow-on-Soar, sodium lighting being chosen. In addition to the indoor lighting, fourteen 140-W sodium lamps in F.L.R. floodlights are used for the exterior illumination of the drying ovens, loading bays, &c. The interior spacing is 30 ft. at a mounting height of 17 ft., each shed being 40 ft. wide, and an average intensity of 10 ft.-candles is obtained. The installation consists of twenty-nine 85-W and fourteen 140-W "Philora" lamps, the former being used in conjunction with Philips "Sora" type dispersive reflectors. The original installation was carried out by J. Jones & Co. (Nottingham), Ltd., and the "Philora"

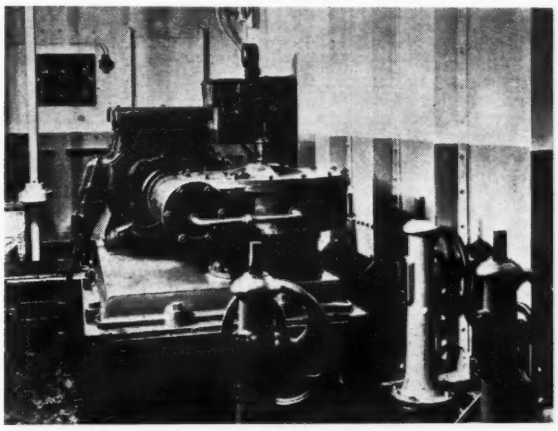
Sodium lighting in the stripping shed of the Potters Marsden works of John Ellis & Sons, Ltd.

equipment was supplied by the Nottingham branch of Philips Lamps, Ltd.

Large Floating Dock

A floating dock recently completed by the Furness Shipbuilding Co. for the South African Railways and Harbours Administration will be stationed at Durban, and has been designed by Clark & Standfield for accommodating vessels up to 4,000 tons displacement. It is of the double walled type, 350 ft. long and 88 ft. wide overall, and is completely electrified by equipment supplied mainly by the British Thomson-Houston Co., Ltd. Power is taken from the local grid at 6,600 V through a vertical-plugging oil circuit-breaker and reduced by a 400 kVA oil-cooled transformer to a 380 V, three-phase, 50-cycle supply which is conveyed by special armoured submarine cables to the dock's metal-clad draw-out switchboard whence it is distributed through an oil-immersed circuit-breaker switch for each feeder. One of these switches serves a 45 kVA lighting transformer on the dock, stepping down to 110 V for distribution *via* an M.E.M. iron-clad switchboard. The four main pumps for raising and lowering the dock were manufactured by W. H. Allen, Sons & Co., and are driven by vertical spindle slip-ring induction motors, each of 45 HP at 582 RPM. The main pump starters are of the automatic contactor type operated by push-buttons and master controllers from a small valve house on the deck. The master controllers give seven operating speeds from 582 to 436 RPM, and each has an ammeter to indicate the load on its motor.

For washing down the hulls of vessels before scraping and painting and general service purposes there is a Dawson and Downie reciprocating pump which will work satisfactorily even when submerged, being driven by a 40-HP horizontal slip-ring induction motor. Compressed air is supplied by a Reavell compressor driven through a flexible coupling at 412 RPM by a 100 HP slip-ring induction motor mounted on the same base-plate. Circulating water for the compressor and the interstage cooler is provided by a Pulsometer vertical spindle suspended pump, driven by a 3-HP squirrel-cage motor in the



A 40 h.p. motor for driving the fire pump on the floating dock to be stationed at Durban

compressor compartment. This pump is controlled by a push-button-operated direct-on starter having a thermal overload relay. On the top deck at each end of the two side walls is a Stothert & Pitt capstan driven by an 18-HP totally enclosed squirrel-cage induction motor. On the starboard wall of the dock there are rails for a 3-ton travelling jib crane supplied by Stothert & Pitt which is capable of lifting, slewing, jib adjusting, and travelling, each motion being operated by a separate motor, totally enclosed and controlled by vertical air-break drum controllers and rustless resistances supplied by the B.T.H. Co. Solenoid brakes are provided on all motions in addition to mechanical brakes on the hoisting, slewing and luffing motions.

Russian Steam Turbine Works

A new steam turbine works is shortly to be constructed at Novosibirsk, learns *Reuter's Trade Service* from Russian papers. A site has been chosen on the left bank of the River Obi. It is estimated that the works will produce turbines of 2,000 to 12,000 kW. The total capacity of the turbines produced in one year will be 300,000 kW and the cost of construction is estimated at 60,000,000 roubles.

Changes of Name

The name of Overseas Communications of South Africa, Ltd., has been change to Cable & Wireless of South Africa, Ltd.

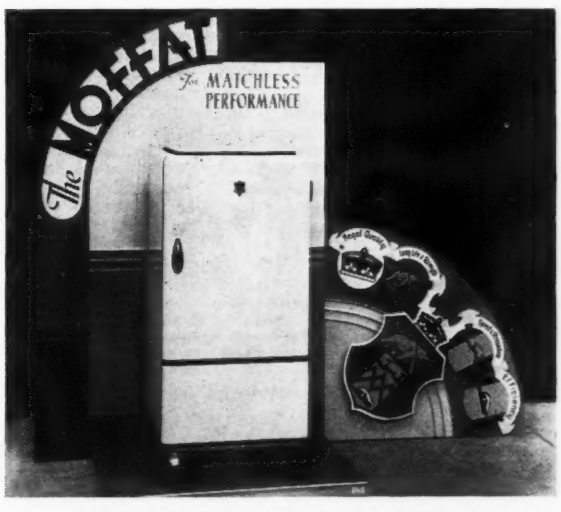
The Guildford Electric Co., Ltd., has changed its name to Spear's Electric, Ltd.

Change of Address

The Bridlington Corporation Electricity Department has moved its electricity offices and showrooms to 16, Quay Road, Bridlington.

A Window Display Background

The accompanying picture shows a new window display background which has been prepared by Moffats, Ltd. In the illustration a refrigerator is shown, but an adjustable



New Moffat window display background

panel at the back to change the height enables the background to be used for cooker displays as well.

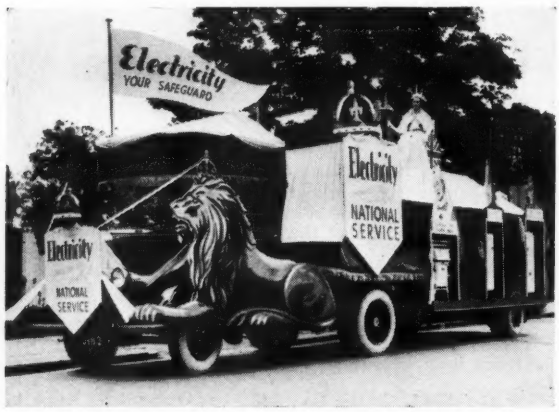
Electricity in Rural Areas

Proposing the toast of "Rural Electrification" at a luncheon of the Mid-East England Area of the British Electrical Development Association at Bourne on June 21st, Coun. G. W. Chatterton, chairman of the Spalding Electricity Committee, said it seemed to him that the only way to finance rural electrification schemes would be by means of a national levy, in the same way as a levy was made for the standardisation of frequency. Mr. N. F. Marsh, acting manager of the Mid-Lincolnshire Electric Supply Co., Ltd., replying to the toast, stated that to reach the 25,000 consumers connected in the company's area they had erected or laid approximately 590 miles of high-voltage mains and 360 miles of low-voltage distribution lines. After the luncheon the members visited the Lincolnshire Show.

New Mansfield Showrooms

The new showrooms of the Mansfield Corporation Electricity Department, described in our last issue, were officially opened on June 20th by Sir Cyril Hurcomb, chairman of the Electricity Commission. The opening was preceded by a luncheon held at the Swan Hotel, presided over by the Mayor of Mansfield (Coun. J. H. Williamson) who is also chairman of the Electricity Committee. In proposing the toast of "The Electricity Supply Industry," the Mayor remarked that in Mansfield 75 per cent. of the population were already connected up, and he hoped that shortly all homes in the area would be supplied.

Mr. A. D. Phillips, general manager of the Derbyshire and Nottinghamshire Electric Power Co., after referring to the cordial relationship which existed between the Mansfield undertaking and his company, expressed the hope that the inauguration of the showrooms would ultimately lead to further development. Replying to the toast of "The Guests," proposed by Ald. G. Abbott, Sir Cyril Hurcomb revealed that a recent return called for by the Commissioners asking electricity undertakings to state the types of vehicles they used showed a very small number of electric vehicles.



This van, decorated by the Croydon Corporation Electricity Department, won prizes in both the Croydon, and South Norwood and Woodside Carnivals

Later the guests assembled in the lecture hall of the new showrooms for the opening ceremony. Sir Cyril stated that for the future of the distribution of electricity every important electricity undertaking must have a showroom with a competent staff, and he congratulated the undertaking on the provision of such an addition without recourse to borrowing money. There were now ten million consumers in the country, he said, and only by bringing to their notice the uses of electricity could progress be made. Electricity would be more popular if tariffs were lower and voltages more uniform, and on the latter point he added that he hoped before long to carry the policy of standardisation still further.

The decorative colour lighting mentioned in the ELECTRICAL REVIEW last week in connection with the description of the new electricity showrooms is carried out by means of the Holophane auto-selective system. The stage of the demonstration theatre is equipped with a footlight batten and three-colour wing flood trolley units, while the back of the stage is a plaster cyclorama with separate top and bottom lighting. One of the showroom windows can be used for stationery or colour changing lighting as required.

British G.E.C. Showrooms at Sydney

The British General Electric Co. Pty., Ltd., representing the General Electric Co., Ltd., of England, recently opened showrooms at the head office in Sydney, N.S.W. The new showrooms are situated on the third floor of the building, and are designed to provide ample space for the demonstration as well as the exhibition of all types of electrical appliances and lighting equipment in appropriate settings. Illumination, with its rapid and recent developments, naturally has a prominent place.

The principles of artistic display combined with utility familiar to those who know G.E.C. methods in this country are carried out in the new Sydney showrooms. There is a period room, where lighting to harmonise with definite styles of furnishing can be inspected in appropriate surroundings; a "crystal" room and a "modern" room, where selections of lighting fittings for home or office form the principal contents. The latest developments in "Osira" lamps, and particularly the progress recently made in the use of fluorescent lighting, are given full illustration, and a tableau consisting of a scene from "Snow White and the Seven Dwarfs" exhibiting the vivid colouring to be obtained by skilful use of this mode of lighting created a great deal of attention among the visitors on the opening day.

Main vestibule of the new British G.E.C. Sydney showrooms

The main corridor (shown in the accompanying picture) is also brought into service, suggesting a showroom of unusual length containing a number of well-arranged ceiling lighting fittings, the effect being heightened by a full-length mirror at the far end. Examples of indirect and semi-direct lighting fixtures are a part of the equipment of the radio room, where "Genalex" receiving sets form the principal subject of display. Domestic requirements are fully catered for by a range of G.E.C. cookers, with ample scope for demonstration, and the latest models of electric fires, irons, and other appliances for the home.

The opening ceremony was performed on April 5th by the Hon. E. S. Spooner, Minister for Works for Local Government, and Mr. Edward Hirst, managing director, presided.

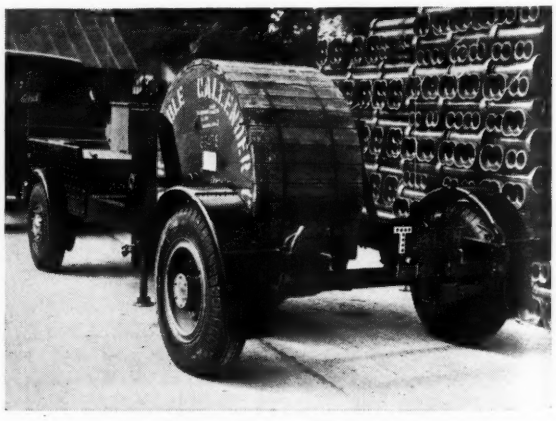
Trade Announcements

The Weston Electrical Instrument Co., Ltd., announces that on and after July 1st all manufacturing and trading operations in connection with Weston electrical instruments will be conducted in this country by Sangamo Weston, Ltd., Great Cambridge Road, Enfield, Middlesex, to whom all inquiries and orders should be addressed.

The Earthing Clip Co., of Liverpool, has now changed ownership, and the plant is being brought up to date. The agents are still Mr. H. A. Caspard in London, Mr. F. G. Geary in the Midlands, and Mr. J. McPherson in Scotland.

A New Cable Drum Carrier

Ease of loading and unloading cable drums and the ability to pay out the cable without dismounting the drums are features of the latest four-wheel turntable trailer constructed by Carrimore Six-wheelers, Ltd., for the Sheffield Electricity Department. The main frame channel side-members are reinforced by steel plates welded between the flanges, while the rearmost cross-member is made detachable, together with the axle and wheels, so that, when these are removed, the cable drum can be rolled in between the side-members and raised



New type of cable drum carrier constructed for the Sheffield Electricity Department

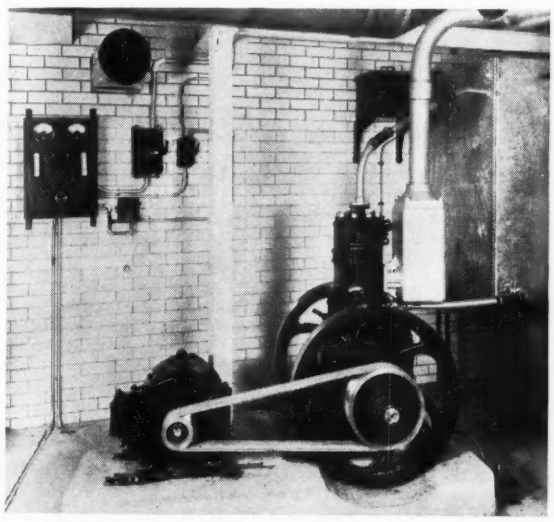
to the travelling position. This is made possible by the provision of hand-operated jacks mounted on each side to support the frame and raise the drum. The ends of the axle carrying the cable drum rest on blocks which are raised and lowered in guides by the jacks. There are two blocks on each side at different levels to suit two sizes of drum. Drums up to about 4 ft. 8 in. wide can be carried, although the overall width is the regulation 7 ft. 6 in. A demonstration held recently at the Finchley electricity works showed how a cable drum could be loaded in about ten minutes.

Employment in May

Employment in the engineering industry between April 17th and May 15th showed an improvement in most of the principal sections of the industry and in electrical engineering was very good. Statistics published in the *Ministry of Labour Gazette* show that the number of unemployed in the engineering industry was 67,549, a decrease of 9,209, as compared with April, the percentage falling by 0.7 to 5.4 (7 per cent. in May, 1938). In electrical engineering there were 4,718 out of work, or 4 per cent., showing a decrease of 0.7 per cent., as compared with the previous month and 1.3 per cent. as compared with May, 1938. The unemployed in the electrical wiring and contracting industry totalled 4,167, falling by 0.6 per cent. to 9.8 per cent. (10.8 per cent. in May, 1938). In the electric cable, apparatus, lamps, &c., group there was also an improvement, the unemployed dropping by 1.1 per cent. to 11,312 (6.3 per cent.), and comparing with 9 per cent. in May, 1938.

A.R.P. Emergency Lighting

For some considerable time there has been a steady flow of Petter self-contained lighting sets for emergency duty in public institutions, hospitals, works, banks, A.R.P. shelters, &c., passing through the company's works. Two of these sets represent recent Petter lighting set installations which have been carried out by John Dodson for a leading London insurance company. One set, installed at Chancery Lane, is of 5 kW and is arranged with a special automatic control panel, which brings it into operation immediately upon the failure of the ordinary mains supply. The engine room in which this set is installed has not been specially constructed to withstand air raids, owing to the fact that the external walls of the main building are 2 ft. thick. The window spaces overlooking the site, however, have been bricked up to a depth of 13½ in. The other set (shown in the accompanying picture) is of 9 kW capacity and is installed in the offices of the same company in Leadenhall Street. The engine room is 40 ft. below road level, and has been specially strengthened to withstand the possible collapse of the entire building. The ducting shown in the photograph is for use in connection with a gas filtration scheme.



Petter set installed for A.R.P. emergency lighting

Works Visits

During the post-congress tour of the International Foundry Congress, which was this year held in London, a visit was paid to the foundry of the Midland Electric Manufacturing Co., Ltd., Birmingham, on June 20th. Visitors, numbering over one hundred, included delegates from France, Germany, Poland, Italy, Sweden, Norway and Japan. They were shown a highly efficient mechanised foundry which has a weekly output of 70,000 machine moulded castings. In addition, a section is devoted to the production of hand-moulded castings where it is not practicable to produce these by machine moulding. The visitors were particularly impressed with the cleanliness in the foundry. The building is of modern construction and the whole of the machinery and plant is finished in aluminium paint, giving an extremely light effect in the shop. A complete dust extraction plant is in operation. Another feature which interested the visitors was the provision of shower and foot baths. During their stay in Birmingham the delegates also visited the foundries of the Austin Motor Co., and W. & T. Avery, Ltd. The tour continues with visits to other sections of the foundry industry throughout England and Scotland.

Lighting a Court House

The lighting of the Court House recently opened by the Surrey County Council at Sutton was planned and carried out by G.V.D. Illuminators, Ltd., in collaboration with Mr. Edwin Finn, surveyor of county buildings. Indirect pendants provide a glareless and shadowless illumination in the Courts, while in the corridor large laylights are the only source of illumination. These admit daylight normally, G.V.D. reflectors providing artificial lighting when required. Three reflectors illuminate the largest of these laylights, while all the others only require two.

Indirect pendants give a remarkably glareless and shadowless lighting at the new Surrey County Council's Court House at Sutton

Prices of Materials

Henry Gardner & Co., Ltd. report, June 28th: Copper bars (best selected), sheet and rod, no change; English pig lead, no change; Spelter, no change; English block tin £229 15s., 15s. increase; Mercury, no change.

Frederick Smith & Co. report, June 28th: Electrolytic copper bars, no change; ditto, ditto, wire rods, no change; ditto, ditto, h.c. wire, no change; Silicium bronze wire, no change.

Edward Till & Co. report, June 28th: India-rubber Para fine, 7⅞d., ⅛d. increase.

L.C.C. Lamp Contract

Siemens Electric Lamps & Supplies, Ltd., tell us that they have again received a contract for the supply of Siemens lamps of all types to meet the requirements of the London County Council for a further twelve months. They mention that the Council which, of course, is a very large consumer of lamps, has a completely equipped laboratory for photometry and electrical testing.

Annual Holidays

The works of Thomas Broadbent & Sons, Ltd., will be closed from Friday, July 14th, until Monday, July 24th.

New Catalogues and Lists

Babcock & Wilcox, Ltd., Babcock House, Farringdon Street, London, E.C.4.—A stiff-covered booklet dealing with tube mills for firing pulverised coal.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Folders describing fittings for architectural lamps and totally enclosed wax-filled chokes for mercury vapour discharge lamps. Also a booklet entitled "Problems of Artificial Illuminations."

Switchgear & Equipment, Ltd., 90-96, Cannon Street, London, E.C.4.—A leaflet describing oil-immersed self-reclosing circuit-breakers.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.—A booklet on rectifiers for battery charging.

Radiovisor Parent, Ltd., 36, Alfred Place, London, W.C.1.—A folder relating to an industrial smoke indicator.

Salford Electrical Instruments, Ltd., Peel Works, Silk Street, Salford, 3.—List No. S.39 describing a layer thickness meter.

Gramophone Co., Ltd., 363, Oxford Street, London, W.1.—Advertising matter relating to H.M.V. refrigerators.

Marconi's Wireless Telegraph Co., Ltd., Electra House, Victoria Embankment, London, W.C.2.—Leaflet No. 1310 dealing with aircraft radio equipment.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, London, W.1.—A booklet dealing with water heating apparatus entitled "Hot Water."

Brook Motors, Ltd., Empress Works, Huddersfield.—Particulars of the new "Indestructible" motors.

Heyes & Co., Ltd., Wigan.—Leaflets on flameproof switchgear for insertion in the company's flameproof catalogue.

British Insulated Cables, Ltd., Prescot, Lancs.—Leaflet describing condensers for electric-discharge lamps.

ELECTRICITY SUPPLY

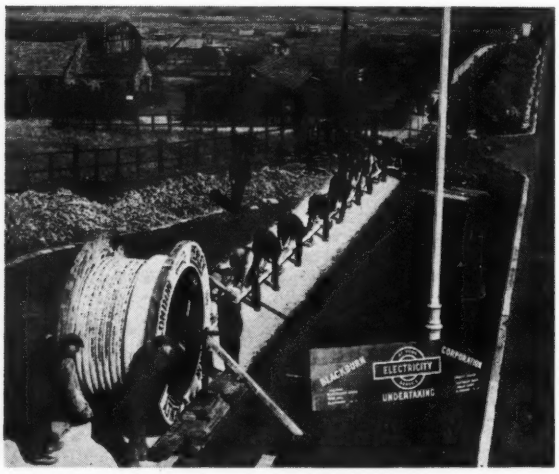
Gosport Public Lighting Decision. Industrial Load-building at Hull. Littleborough Council's Power Points Problem. Proposed Reductions in Charges at Manchester. Lamp "Life" at Sheffield. Swansea's Publicity Expenditure.

Ashton-under-Lyne.—WITHDRAWAL OF COOKER HIRE SCHEME.—Mr. George Taylor, consumers' engineer, stated at a cooking demonstration last week that the Corporation was ceasing to let out electric cookers on simple hire. In future cookers would be supplied on hire-purchase only. People who applied for new cookers during the next fortnight would have the first instalment credited to them without it costing them a penny.

Bacup.—CONSUMERS' WIRING.—Sanction is being sought by the Town Council to a loan of £2,000 for consumers' wiring installations.

Barnoldswick.—PLEBISCITE ON SALE OF UNDERTAKING.—A ratepayers' committee is conducting a plebiscite of the town on the decision of the Council to dispose of the electricity undertaking to the Electrical Distribution of Yorkshire, Ltd. If the vote shows a substantial majority against the present policy of the Council, a petition urging the retention of the undertaking will be presented to the Electricity Commissioners.

Blackburn.—TRANSMISSION SCHEME.—Last week-end a start was made on the 33,000-V transmission scheme of the Blackburn Electricity Department, cable being laid from the Whitebirk station to a new sub-station in Roman Road.



Laying a 33,000-V cable at Blackburn

Eventually the town will be encircled with this new cable. The scheme is being carried through by the Department by direct labour.

Brighton.—SUB-STATION PLANT.—To provide sufficient plant capacity to deal with the change-over from DC to AC in the south-eastern area, the Paston Place sub-station is to be augmented by two 250-kVA transformers, two 300-A 150-MVA rupturing capacity high-voltage switch panels, cables, etc., at a cost of £1,900, for which borrowing powers are being sought.

Calne.—REDUCED CHARGES.—In view of the successful year's trading the Town Council is to reduce the price of electricity by ½d. per kWh to those now paying 6½d. per kWh, and by ¼d. to those now paying 8d. per kWh.

Colchester.—STREET LIGHTING.—Terms have been arranged with the East Donyland Parish Council for the provision of street lighting at Rowhedge.

SUPPLY TO CAMP.—The Electricity Committee is to provide a supply at a cost of £650 to a War Department camp near Berechurch Hall Road.

Croydon.—INCREASED SUPPLY TO AERODROME.—At the request of the Air Ministry, the Electricity Committee is to increase the supply to the airport at a cost of £2,558.

POWER STATION SCHEME.—In connection with the scheme for the provision of a new power station at a cost of £1,260,300, the Electricity Committee recommends the appointment of Messrs. Allott and Son, Manchester, as constructional engineers and Mr. Rendell-Baker, the chief engineer and manager, as consulting engineer for the mechanical and electrical works.

Gateshead.—OVERHEAD SUPPLY TO WARDLEY.—Two new overhead lines are to be erected from Dunston power station to Wardley, in the Felling area, to serve a new housing estate.

Gosport.—STREET LIGHTING TO BE ELECTRIC.—The Borough Council has accepted the tender of the Portsmouth electricity undertaking for street lighting for fifteen years from July 1st. The approximate annual cost under gas was given as £6,143, and for the same number of lamps by electricity, £7,272. The joint meeting was unable to reach a decision, so the matter was referred to the full Council with the result that the tender for electric lighting was accepted by 22 votes to 7.

Hastings.—NEW EQUIPMENT.—Sanction is being sought by the Town Council to a loan for carrying out modifications and extensions to the existing switchgear, the erection of an additional switchhouse at the Broomgrove power station, and alterations to cables and transformers. The estimated cost of this work is £16,630.

Hull.—AIR-RAID PRECAUTIONS.—Members of the Electricity Committee and the A.R.P. (Special) Committee last week inspected the precautionary measures taken at the Ferensway showrooms, the Sculcoates power station, and the Clough Road depôt, and watched a test of the emergency organisation. Particular interest was taken in experiments which demonstrated the value of ultra-violet rays when subdued lighting is required.

ANOTHER LARGE CONSUMER.—In March the general manager of the Electricity Department (Mr. D. Bellamy) reported that the department was to take over the supply to a local company which had hitherto generated its own electricity, involving an increase in output of about 8,000,000 kWh annually. Last week Mr. Bellamy reported that negotiations had been completed with another company which proposed to open new works in the city and would take between 1,750,000 and 2,000,000 kWh during the course of the year. The chairman (Alderman B. Pearlman) expressed pleasure that the undertaking was obtaining such big bulk supplies, and Councillor I. Robinson remarked that something was being done through the use of electricity towards smoke-nuisance abatement.

DOMESTIC DEVELOPMENT.—The general manager announced that the monthly installations of cookers represented an increase of 21 per cent. over the corresponding period of last year, while the number of water heaters installed had increased from 87 to 339.

Jarrow-on-Tyne.—SUB-STATION SITE.—The Town Council has granted an application by Northern Rediffusion Services, Ltd., for a site in Primrose Terrace for a sub-station.

Keynsham.—SODIUM LIGHTING.—The Urban District Council proposes to have sodium lighting installed on the trunk road (A.4) between Broadmead and the Glen at an estimated cost of £2,268 .

Leicester.—SURPLUS FOR DEBT REDEMPTION.—A surplus of £30,600 on the past year's operations of the Electricity Department is reported. This will be allocated to redemption of debt instead of the relief of the city rates.

Littleborough.—POWER POINTS IN COUNCIL HOUSES.—The Housing Committee is applying to the Minister of Health for a direction under the Housing Act, 1936, to cover the cost of providing power points in houses erected under the Housing Act, 1919. At the Council meeting the chairman said they had been trying for four years to get the Minister of Health to give this permission. The clerk stated that the Minister of Health had declined to allow the cost to be charged to the capital account or to the housing repairs fund. The Minister had now promised to consider issuing a direction that the Council could charge the cost to the housing revenue account, subject to approval of the details of the scheme. As there was a deficit on the account this would mean that the cost would fall on the rates. One councillor contended that the cost of installing power points should be borne by the Electricity Department which was responsible in the first case for the unsatisfactory wiring on the Council's housing estates. The chairman replied the houses were built to the Ministry's in-

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

NEWLEX vacuum cleaners.

structions and had nothing to do with the Electricity Department. The Ministry would not allow the points to be installed.

London.—ELECTRICITY IN SCHOOLS.—The London County Council Education Committee is to install electricity at the Plough Road school, Battersea, and the Princess May Road school, Stoke Newington.

POPLAR.—The Electricity Committee is to effect change-over in the Millwall area at a cost of £1,000.

Manchester.—PROPOSAL TO REDUCE CHARGES.—The City Council, at its July meeting, will be asked to approve reductions in electricity charges amounting to £108,000 in a full year. The reductions affect practically all items of the tariff.

GENERATING STATION EXTENSIONS.—It is proposed to apply for borrowing powers amounting to £892,420 for extensions to the Stuart Street power station. This will provide for the installation of two 30,000-kW turbo alternators, and four new boilers.

Sheffield.—MORE ELECTRIC STREET LIGHTING.—In his report for the past year, Mr. J. F. Colquhoun, lighting engineer, reveals that the consumption of electricity rose by more than a million kWh to 5.3 million kWh, while the quantity of gas consumed decreased by 21.3 million to 244.3 million cu. ft. At the end of March there were 10,779 electric lamps in use (1,538 increase) and 13,777 gas lamps (847 decrease). Since 1935-36 the consumption of electricity has more than doubled, being then only 2.4 million kWh. At the close of the year the re-lighting of the Neepsend Lane, Shoreham Street and Brightside Lane (part) traffic routes was in hand, and plans were in a forward state for similar work in twelve other roads, while a great deal of lighting work was proceeding on new housing estates. In his previous report, Mr. Colquhoun referred to the lower burning life of electric lamps in the 100- and 150-W sizes, which averaged 907 hours. The steadying of voltages and the correction of abnormally low voltages, he states, accounted to some extent for this decreased life, and he approached the lamp manufacturers with a view to obtaining lamps adjusted to the changed conditions. He now reports that the manufacturers worked with him most enthusiastically in the matter, and as a consequence the average life has improved to 1,086 hours. In 100-W lamps this meant a saving of 5,556.

Stirling.—MOTOR CONVERTOR.—The Electricity Committee, on the suggestion of Mr. William R. Murray, electrical engineer, has recommended the installation of a 750-kW La Cour motor convertor, complete with switchgear, in place of three or four small generating sets. The cost of the motor convertor is estimated at £3,270.

Sunderland.—PROPOSED SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is acquiring a site on the Springwell Farm Estate for a sub-station.

Swansea.—ELECTRICAL PUBLICITY.—The Finance Committee has approved a recommendation by the Electricity Committee that one per cent. of the income from the sale of electricity, excluding bulk supplies, plus the gross surplus on the sale of fittings—against which would be charged the cost of the showrooms and all publicity expenditure—should be allocated to provide a source of income to be earmarked for propaganda.

NEATH ROAD DEVELOPMENTS.—The Committee is to extend cables to Neath Road sub-station and install transformers and switchgear at a cost of £30,000.

Thornaby-on-Tees.—ELECTRICITY IN COUNCIL HOUSES.—The question of installing electricity in houses on the Council's estate was discussed at a recent meeting of the Town Council. Replying to Councillor Collinson, the Mayor (Ald. Dacre) said that the North-Eastern Electric Supply Co. was not prepared to install electric lighting in Council houses on the hire-purchase system. The cable was laid and tenants could make arrangements for services to be laid to their houses at their own expenses. The Mayor added that the Housing Committee was considering a plan in this connection but no decision had been reached.

Whitworth.—SUB-STATION EQUIPMENT.—The Council has decided to co-operate with the Rochdale Electricity Department in the purchase and installation of equipment at the Healey sub-station at an estimated cost of £1,300.

Workington.—EXTENSIONS.—The Town Council proposes to afford a supply of electricity to Northside and Siddick, at an estimated cost of £3,350.

Overseas

Canada.—WATER-POWER RESOURCES.—The annual inventory of the developed and undeveloped water-power resources of Canada undertaken by the Dominion Water and Power Bureau of the Department of Mines and Resources, Ottawa, reveals a total of 20,347,400 HP under conditions of ordinary minimum flow and 33,617,000 HP ordinarily available for six months of the year. It has been proved sound practice to allow a turbine installation 30 per cent. in excess of the ordinary six months' flow power, so that the present recorded resources would permit of a turbine installation of 43,700,000 HP, of which the actual plant installed at January 1st, amounting to 8,190,722 HP, represents only 19 per cent. Central electric stations are responsible for nearly 88 per cent. of Canada's hydraulic development, and this represents more than 98 per cent. of the main generating plant of the industry.

France.—PROGRESS OF ELECTRIC COOKING.—According to a report issued by the Société pour le Développement des Applications de l'Electricité, at the end of September, 1938, there were approximately 240,500 electrical cooking appliances in use in France, Northern Africa, and Madagascar, an increase of 44,500 during the year. In the commercial field the report states that there are now 1,636 restaurants entirely equipped with electrical appliances, with a total capacity of 13,736 kW. In 1935 there were only 422.

India.—MYSORE ELECTRICAL PROGRESS.—The hydro-electric works in Mysore yielded a much larger revenue in the past year than in the previous twelve months, and the revenue for the ensuing year is estimated at a still higher figure. Rural electrification is proceeding rapidly. The work on the new Shimsha project is progressing satisfactorily and the station is expected to be in operation before the end of 1939. The Budget presented by the Dewan provides Rs.39 lakhs for the new Jog Falls project, but its details have not yet been finally decided.

Sweden.—NEW POWER PLANTS.—In order to meet the increasing demand for power in Stockholm, it is proposed to erect a large water-power plant on the River Indal. Designed to utilise a head of about 215 ft. between the lakes Kallsjon and Liten, the new station will have a capacity of about 103,000 kW. Part of the output will be distributed locally, but the bulk will be transmitted over 120-kV lines to Stockholm The total expenditure is estimated at £1,375,000. The Swedish Waterfalls Board recently ordered two Kaplan turbine sets of 35,000 kW each for a new underground power station at Hojumsvarp, near Tröllhattan, and a third set is to be ordered later. The Graningeverken company is to build a 72,000-kW hydro-electric station on the River Faxalven at Hjalta, near Langsele. The machine room will be blasted out of the rock and covered with a concrete roof for protection from aerial attack. The new plant will utilise a head of approximately 155 ft., and is estimated to cost £1,650,000.

TRACTION

Glasgow.—TROLLEY-BUSES.—Councillor Victor D. Warren has given notice of a motion that a special sub-committee shall consult with the Ministry of Transport as to their attitude on the conversion of the tramway system in the city to trolley-buses and whether any grant could be obtained towards the cost. He is also to move that the committee shall ascertain the exact capital cost and annual maintenance charges and estimated life of the vehicles by means of a small experiment with not more than nine 70-seater vehicles on a route up to three miles in length.

L.N.E. Railway.—COLOUR-LIGHT SIGNALLING.—A further stage in the installation of electric colour-light signalling on the L.N.E.R. main line has been reached by the opening of a new signal box at Eryholme Junction, five miles south of Darlington. The resignalling between Northallerton and Darlington links up with the existing colour-light signalling from Darlington to just north of York station. The signals have lights which are visible for at least 1,500 yards in bright sunlight and are specially designed to penetrate fog. More than 100 miles of flame-proof wire has been used inside the various signal boxes, and about fifty miles of steel armoured cable has been laid between the signal boxes and the apparatus they control.

Newcastle-on-Tyne.—DISCONTINUATION OF TRAM ROUTE.—Trams on the Westmoreland Road route are to be replaced by motor-buses on July 2nd.

Nottingham.—POSSIBILITY OF TROLLEY-BUSES.—Application is being made to the Minister of Transport for a two-years' extension of the period, under an existing Order, in which a trolley-bus service can be commenced on a short route in the city. At present the route is served by motor-buses.

Southern Railway.—ELECTRIFICATION IN KENT.—On Monday next a number of new electric services will be inaugurated in Kent. At present electric trains from London do not travel beyond Gravesend, Sevenoaks and Swanley, but the new scheme, which is in three sections, provides for extensions from Offord to Maidstone East (16 miles), from Gravesend Central to Maidstone West via Strood and from Strood to Gillingham (19 miles), and from Swanley to Gillingham on the main line (19 miles).

Writing in *Modern Transport* Mr. A. Raworth, chief electrical engineer of the Southern Railway, states that the company now owns some 3,189 passenger-carrying electrically operated vehicles. Of this total 2,586 are fitted with electrical equipment designed for a maximum speed of 60 m.p.h., while the remaining 603 cars have an equipment designed for a maximum speed of 75 m.p.h. It is an interesting fact, he says, that in the first batch of 336 motors of the former type—which have been in continuous service since 1915—only five armatures have had to be rewound.

Sweden.—SUCCESS OF ELECTRIC RAILWAY OPERATION.—Speaking at a recent meeting of engineers, Mr. Ivar Overholm said that 50 per cent. of the lines of the Swedish State Railways had been electrified, and these handled about 85 per cent. of the total rail traffic. The present length of electrified lines was about 3,700 km., and new schemes were approaching completion. Last year electric locomotives ran about 24 million miles, and their power consumption was upwards of

500,000,000 kWh. In addition to profitable working, electrification had resulted in an increase in the speed of passenger trains by up to 30 per cent., and electrically hauled goods traffic was 50 per cent. faster. It had been found, he said, that the fast, quiet, and comfortable running of electric trains attracted large numbers of passengers who would otherwise have chosen other means of transport, and thus enabled the railways to compete more successfully with highway and air transport. During the two decades 1910-30, £4,800,000 was spent on railway electrification in Sweden, while from 1931 to 1938 roughly £10,000,000 was spent, and new schemes in progress from the beginning of this year involve a further £4,300,000.

Switzerland.—RAILWAY ELECTRIFICATION.—In the course of an article by M. C. Bodmer, chief engineer of the Oerlikon Co., on the development of the use of single-phase power for traction on the Swiss Federal Railway in a recent issue of the *Revue Générale de l'Electricité*, the author states that the electrification of the railways in Switzerland has now reached a point when the work may be regarded as practically completed. The whole of the power used is supplied by hydro-electric plants, the annual demand for railway traction equalling approximately 10 per cent. of the country's output.

COMMUNICATIONS

Belgium.—TALKING CLOCK.—Belgium's "talking clock," corresponding to the British "Tim" call service, earned 2,682,055 francs (about £19,000) by complying with 6,705,138 requests for the correct time during 1938, according to *Le Soir*. In Belgium the system is bi-lingual, inquirers having the choice of two numbers, according to whether they require the time to be given in French or Flemish. The majority of the calls were made to the French speaking clock.—*Reuter*.

China.—SHANGHAI-ROME RADIO-TELEPHONE SERVICE.—A *Reuter* report from Tokyo states that a direct radio-telephone service has been inaugurated between Shanghai and Rome through the radio station at Chenju, a few miles outside Shanghai. The Chenju station, destroyed by Chinese troops before their retreat from the Shanghai area, was restored by the Central China Electric Communication Co., a joint Sino-Japanese concern. A direct radio-telephone service with Berlin was inaugurated on May 4th.

Denmark.—TELEPHONY.—A carrier-wave cable is being provided between the two largest cities of the province of Jutland, Aarhus and Aalborg. Later it is proposed to extend this new link beyond Aarhus *via* Kalundborg to Copenhagen. The first section of the cable is estimated to cost the equivalent of £110,000.

RADIO FOR FIRE FIGHTING.—A system of radio communication has been adopted by the Copenhagen Fire Department. This includes two mobile transmitters operating on 143 metres and a transmitter at headquarters working on 174 metres.

Great Britain.—TELEVISION.—Last week a deputation organised by the Radio and Television Traders' Federation was received by the Postmaster-General. It comprised representatives of the Wireless Retailers' Association, the National Association of Radio Retailers, Ltd., the Scottish Radio Retailers' Association, the Wales & Monmouthshire Radio Retailers' Association, and the Coventry Musical & Radio Retailers' Association, the object being to emphasise the necessity for an extension of the television service to the provinces and Scotland. It was asserted that radio and television were two distinct forms of entertainment, and that there was a demand for television. If the difficulty was a financial one, the deputation proposed that the existing 10s. wireless licence fee should remain, but that a new licence should be introduced for the radio and television services at a combined fee of £1 per annum. The provision of one provincial television station this year, two further stations by the end of 1940, and an 85 per cent. coverage by 1942, was asked for. The Postmaster-General stated in reply that the Television Advisory Committee had been investigating the problem in all its aspects, and he understood that it was about to submit a report to him on the subject. He promised that in considering the report he would give full weight to the representations made to him by the deputation.

RELAY SERVICES.—Increases in the capital of relay companies are announced as follows: Motherwell Relay Service, Ltd. (from £1,000 to £4,000); Lancashire & Cheshire Rediffusion Services, Ltd. (from £25,000 to £27,500); South Wales Rediffusion Services, Ltd. (from £50,000 to £55,000); K.L.M. Radio Relays, Ltd. (from £24,000 to £40,000); Midland Rediffusion Service, Ltd. (from £12,500 to £15,000); Northern Rediffusion Services, Ltd. (from £70,000 to £150,000); and Nottingham Rediffusion Service, Ltd. (from £20,000 to £50,000).

Switzerland.—RADIO CONFERENCE.—*Reuter* reports from St. Moritz that Sir Cecil Graves, Deputy Director-General of the B.B.C., has been elected a vice-president of the International Broadcasting Union which has just closed its annual summer session. Twenty-eight Governments and broadcasting companies were represented at the meeting, when Burmese and Uruguayan organisations were received into the Union. M. Dubois, Holland, was re-elected president of the Union, and Herr Boeckmann, Germany, M. Nelky, Hungary, and M. Raestad, Norway, were elected vice-presidents in addition to Sir Cecil Graves.

London J.E.A.

AT the meeting of the London and Home Counties Joint Electricity Authority on Wednesday the following matters were discussed:—

Writ Against C.E.B.—It was reported that a writ had been issued against the Central Electricity Board in respect of damage suffered by the Authority resulting from the fire at the Kingston generating station on December 14th. The C.E.B. has been informed that these proceedings have been commenced for the purpose of protecting the Authority's interests, having regard to the provisions of the Public Authorities Protection Act, 1893.

Alternative Sources of Supply.—A report has been considered upon the provision of alternative sources for the bulk supplies given by the Authority to other authorised undertakings and taken for its own local distribution undertaking. The proposals contained in the report have been supplied to and discussed with the Electricity Commissioners, whose views will be communicated in due course.

New Proposals for Revaluation.—In April attention was called to the fact that the rating authorities, at the request of the county valuation committees, had made fresh proposals for the revaluation of the Authority's undertaking with a view to the effect of such revaluation dating back to April, 1938. In view of counsel's advice on these points the rating authorities, the county valuation committees and the assessment committees have been informed that the Authority intends to take legal proceedings to test the validity of the fresh proposals and the proceedings leading thereto. Instructions have also been given for the attention of the Conjoint Conference of Public Utility Undertakings to be called to the position.

Voltage Standardisation.—The Authority has been notified by the Hampstead Borough Council of its application to the Electricity Commissioners for consent to the adoption of the national standard of 230 V in connection with the supply to all consumers in the borough, the first instalment of the work to be carried out during the current financial year at an estimated cost of £7,500.

Reliability of Supply.—An investigation has been made of the Authority's distribution system to ascertain any sub-station and switchgear modifications and fire protection works, together with transmission system reinforcement, which may be desirable to meet modern conditions and ensure greater reliability of supply, and proposals have been formulated under which an expenditure of £114,603 will be incurred in 1939-40 and £33,125 in 1941-42. Approximately 60 per cent. of this expenditure would have been necessary in the course of normal development. The object of now presenting the proposals is to accelerate reinforcement to secure greater reliability of supply, and to minimise the risk of interruptions.

Street Lighting.—Requests have been received from the Twickenham Corporation and the Banstead Urban District Council for the Authority's tenders for the installation of public lighting in the whole of the borough of Twickenham and part of the urban district of Banstead.

Birmingham Contract Policy

AN important question of policy is raised by a decision of the Birmingham Electric Supply Committee which is to come before the Council on July 4th for approval. The Committee reports that it is now necessary to deal with the provision of underground main transmission lines, transformers and associated switchgear to connect the "B" station with the "A" station and with the main distribution centres in the city. The estimated cost of this work is £453,550, and the Committee states that it has given careful consideration to the procedure to be adopted in obtaining tenders for the high-voltage cables, switchgear and transformers included in the estimate.

The Committee is of opinion that an open invitation to tender by way of public advertisement will result in the submission of "ring" controlled prices, with a consequent restriction of financial choice, or the alternative necessity of placing the works with manufacturers predetermined in their price by a "ring" whose products might not be favoured.

It is considered that appreciable financial and technical advantage will accrue to the Corporation if prices are negotiated with selected manufacturers in a manner similar to that approved of in the case of turbo-alternators, boilers and switchgear at the "B" station, and the Committee has given authority for such negotiations to be proceeded with.

More Battery Vehicles

IN each of the first four months of this year the number of new registrations of electrically propelled commercial vehicles was larger than in the corresponding month of last year. Up to the end of April new registrations numbered 299 compared with 273 at the same date last year, making the total number of such vehicles registered 4,674.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Electrical Undertakings, Ltd.—Private company. Registered June 22nd. Capital, £500. Objects: To carry on the business of electrical engineers and contractors, &c. Directors: J. Walker, 6, Spinkfield Road, Birkby, Huddersfield; and Mrs. M. B. Tordoff, The Cedars, Nightingale Road, Guildford. Registered office: 44, Whiteheads Yard, King Cliffe Road, Birkby, Huddersfield.

Bishop Sound and Electrical Co., Ltd.—Private company. Registered June 22nd. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus, accessories and components and particularly wireless and television sets, valves, radio-gramophones, records, &c. Subscribers: J. Bishop, 309, Roman Road, Bow, E.; and C. E. Killick, Manor House, Datchet, Bucks. Registered office: 40, Chancery Lane, W.C.2.

European Technicians, Ltd.—Private company. Registered June 2nd. Nominal capital, £100. Objects: To carry on the business of technical advisers and consultants, research workers, laboratory owners, organisers and supervisors of the manufacture of scientific instruments and machinery and particularly those relating to a humidity indicator for use in the textile and other industries, an instrument for testing wires and cables of magnetic and non-magnetic materials, the development of material testing instruments, &c. Subscribers: W. Foges, 6, Newman Street, W.1; and G. S. Davis, 200, High Holborn, W.C.1. Registered office: 200, High Holborn, W.C.1.

Universal Heaters, Ltd.—Private company. Registered June 22nd. Capital, £100. Objects: To carry on the business of manufacturers, exporters and importers, wholesalers and retailers of all articles, machines, apparatus or devices, including those covered by registered design No. 831019 and provisional patent No. 27640, at present owned by W. Thimblethorpe, and to carry on the business of ironfounders, mechanical engineers, toolmakers, wireless and electrical engineers, &c. Directors: F. H. Curtis, 108, Dulwich Village, S.E.21; and J. D. Norton, 68, Baker Street, Potters Bar, Middlesex.

Shirley Electrical Co., Ltd.—Private company. Registered June 24th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical apparatus and accessories, wireless and television sets, gramophones, &c. Subscribers: J. F. Hutchinson, 21, Shirley Way, Shirley, Surrey, electrical engineer; and E. P. Coleman, 64, Culverden Road, S.W.12. accountant. Secretary: E. P. Coleman.

Commander Radio and Television Co., Ltd.—Private company. Registered June 23rd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio and television apparatus, &c. Subscribers: S. Morris, 9, Parham Drive, Ilford; and C. D. Wills, 34, Addison Gardens, W.14. Secretary: C. D. Wills. Registered office: Bassishaw House, 70a, Basinghall Street, E.C.

Punfield & Barstow (Mouldings), Ltd.—Private company. Registered June 19th. Capital, £10,000. Objects: To acquire a business of manufacturers and merchants of plastic mouldings and similar goods, being part of the business now carried on by Punfield & Barstow, Ltd. The permanent directors are: F. W. Punfield (chairman), 18, Hoop Lane, Golders Green, N.W.11; N. B. Punfield, 23, Belmont Court, Finchley Road, N.W.11; and T. E. Barstow, address not stated. Registered office: Basil Works, Westmoreland Road, Queensbury, N.W.9.

Star Electro Carbons, Ltd.—Private company. Registered June 14th. Capital, £500. Objects: To acquire the business of a manufacturer and vendor of electrical and other components carried on by A. B. Spicer at 218, Old Street, E.C.1, Cleveland Road, E.18, and elsewhere, as Star Electro Carbons. A. B. Spicer, 44, Pinner Road, Harrow, is first director. Secretary: C. L. Argent, 81, Cranbrook Road, Ilford. Registered office: 218, Old Street, E.C.1.

Companies' Returns

Statements of Capital

Electrical Contracts & Maintenance Co. (1925), Ltd.—Capital, £3,000 in £1 shares. Return dated March 30th. 2,405 shares taken up. £2,405 paid. Mortgages and charges, nil.

British Insulated Cables, Ltd.—Capital, £3,000,000 in £500,000 5½ per cent. "A" preference stock, £500,000 6 per cent. preference stock, and £2,000,000 ordinary stock. Return dated April 11th. All stock taken up. £2,572,675 paid on £500,000 "A" preference stock, £372,350 6 per cent. preference stock, and £1,700,325 ordinary stock. £427,325 considered as paid on remainder. Mortgages and charges, £700,000.

Time Signs, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1938 (filed March 25th, 1939). All shares taken up. £202 paid. £298 considered as paid. Mortgages and charges, nil.

Electric and Ordnance Accessories Co., Ltd.—Capital £50,000 in £1 shares. Return dated March 2nd. 45,002 shares taken up. £2 paid. £45,000 considered as paid. Mortgages and charges, nil.

Ringwood Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 9th. All shares taken up. £50,000 paid. Mortgages and charges, nil.

Park Royal Engineering Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 24th. 37,605 shares taken up. £36,605 paid. £1,000 considered as paid. Mortgages and charges, nil.

British Thomson-Houston Co., Ltd.—Capital, £4,000,000 in 2,000,000 7 per cent. cumulative preference and 2,000,000 ordinary shares of £1. Return dated April 4th. 1,500,000 preference and 2,000,000 ordinary shares taken up. £3,425,310 paid. £74,690 considered as paid. Mortgages and charges, £1,269,260.

Woodfyt Sales, Ltd.—Capital, £2,550 in 1,000 preference and 1,550 ordinary shares of £1. Return dated January 26th, 1938 (filed May 9th, 1939). 1,000 preference and 255 ordinary shares taken up. £1,255 paid. Mortgages and charges, nil.

Standage Power Couplings, Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1. Return dated December 31st, 1938 (filed March 17th, 1939). 1,000 ordinary and 800 preference shares taken up. £2,300 paid (£1 per share, plus premiums of 11s. 1½d. on 450 ordinary and £5 on 50 ordinary shares). Mortgages and charges, nil.

Dielectrics, Ltd.—Capital, £100 in £1 shares. Return dated January 9th. 50 shares taken up. £50 paid. Mortgages and charges, nil.

British Columbia Electric Railway Co., Ltd.—Capital, £6,320,000 in £1,440,000 per cent. cumulative perpetual preference stock, £1,440,000 preferred ordinary stock, £2,406,103 deferred ordinary stock and 1,033,897 shares of £1. Return dated February 24th. All stock taken up. £5,086,103 paid. £200,000 considered as paid. Mortgages and charges, £2,788,170.

Brentford Electric Supply Co., Ltd.—Capital, £100,000 in £1 shares. Return dated March 7th. 90,000 shares taken up. £90,000 paid. Mortgages and charges, nil.

East Suffolk Electricity Co., Ltd.—Capital, £125,000 in £1 shares. Return dated March 9th. All shares taken up. £135,000 paid (£1 per share, plus 16s. 8d. premium on 12,000 shares). Mortgages and charges, £14,300.

Trent Valley and High Peak Electricity Supply Co., Ltd.—Capital, £200,000 in £1 shares. Return dated March 9th. All shares taken up. £210,666 13s. 4d. paid (£1 per share, plus 2s. 8d. per share premium on 80,000 shares). Mortgages and charges, nil.

Mortgages and Charges

Streamline Radio, Ltd.—Particulars filed of £11,500 debentures (inclusive of a series of £9,000 authorised by resolutions dated November 11th, November 15th, and November 30th, 1937; March 17th and September 19th, 1938; and April 13th, 1939), authorised May 23rd, 1939, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £2,500.

Home Utilities, Ltd.—Issue on June 8th, 1939, of £5,000 debentures, part of a series already registered.

Romford Radio, Ltd. — Debenture charged on the company's undertaking and property, including uncalled capital, dated June 6th, 1939, to secure £100. Holder: Fdk. H. Scott, 8, Hampden Hill Parade, Chase Cross Road, Romford, Essex.

A. E. Dees, Ltd.—Debenture charged on the company's interest in hiring and hire-purchase agreements and the company's undertaking and property, present and future, including uncalled capital, dated June 5th, 1939, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

Newton Brothers (Derby), Ltd.—Satisfaction to the extent of £60,000 (balance) on June 1st, 1939, of debenture registered October 29th, 1929.

Batterby & Hefford, Ltd.—Satisfaction to the extent of £280 on May 31st, 1939, of series of debentures authorised by resolution dated May 10th, 1934, and registered June 5th, 1934. (According to the register of mortgages the series of debentures registered June 5th, 1934, originally secured £280.)

Clear Hooters, Ltd.—Satisfaction (a) to the extent of £759 on August 31st, 1931, of debentures (third series) registered May 13th, 1927; (b) to the extent of £500 on January 15th, 1934, of first debentures (series "A") registered April 28th, 1927; (c) to the extent of £2,400 on August 31st, 1933, of debentures (third series) registered February 23rd, 1932; and (d) to the extent of £505 on August 31st, 1931, of first debentures (series "D") registered September 13th, 1928. (Notices filed June 19th, 1939.)

Kamm & Co., Ltd.—Two debentures, charged on the company's undertaking and property, present and future, including uncalled capital, dated June 6th, 1939, to secure £200 and £100 respectively. Holders: (a) Jean Cole, 91, Rosehill Park West, Sutton, Surrey, and (b) A. Haringman, 85, The Avenue, N.W.6.

Receivers Appointed and Released

William M. Betts, Ltd.—Ernest Clark, of 52/4, High Holborn, W.C.1, ceased to act as receiver on June 17th, 1939.

J. Warsop & Co., Ltd.—Arthur Kingston, 8, Millmead, Guildford, was appointed receiver on June 14th under powers contained in debenture dated June 15th, 1938.

Morton Industries, Ltd. — Daniel Mahony, 3, Salters Hall Court, Cannon Street, E.C., was appointed receiver and manager on June 16th under powers contained in debenture dated May 16th, 1937.

Electric & Radio Supplies, Ltd.—Talford G. Cook, of 6 and 8, Blagrave Street, Reading, was appointed receiver and manager on June 14th, 1939, under powers contained in debentures dated September 12th, 1932.

Britannia Radio and Television Co., Ltd.—Daniel Mahony, of 3, Salter's Hall

Court, Cannon Street, E.C.4, was appointed receiver and manager on June 9th, 1939, under powers contained in debenture dated June 1st, 1938.

Lawford, Hovell & Co., Ltd.—Eugene H. J. Lafford, of 62, Naylor Road, Totteridge, Middlesex, ceased to act as receiver and manager on June 9th, 1939.

Kniveton Cable Works, Ltd.—Hugh H. Rose, 190, Palmerston House, Old Broad Street, E.C.2, was appointed receiver on June 16th, 1939, under powers contained in debenture dated October 18th, 1938.

Increases of Capital

Franks & Co. (Radio), Ltd.—The nominal capital has been increased by the addition of £900, in £1 ordinary shares, beyond the registered capital of £100.

Northwood Electric Light and Power Co., Ltd.—The nominal capital has been increased by the addition of £10,000, in £1 ordinary shares, beyond the registered capital of £280,000.

Associated Utilities, Ltd.—The nominal capital has been increased by the addition of £95,000, in £1 ordinary shares, beyond the registered capital of £155,000. The new shares have been allotted for cash to the Mid-Southern Utility Co.

West Kent Electric Co., Ltd.—The nominal capital has been increased by the addition of £1,000,000 beyond the registered capital of £500,000. The additional capital is divided into 500,000 4½ per cent. cumulative preference and 500,000 unclassified shares of £1 each.

Private Arrangement

Garston Electrical Co., electrical contractors, Holland Gardens, Garston, Herts.—A meeting of the creditors was held on June 22nd at the Hotel Russell, Russell Square, London, W.C., when the statement of affairs showed liabilities of £989. The total assets were £665, leaving a deficiency of £324. The present position was attributed largely to lack of capital. No offer of composition was submitted, and it was decided that the matter should be dealt with under a deed of assignment to Mr. H. C. Treby, accountant, of 7, Warwick Court, London, W.C., as trustee, with a committee of the principal creditors.

Bankruptcy Proceedings

C. S. Harrison, electrician, formerly electrical contractor and radio engineer, "Macredel," Ismay Road, Chaddesden, Derbyshire, formerly carrying on business at 68, Derby Road, Stapleford, Nottinghamshire, under the style of "Harrison and Harrison."—The first meeting of creditors was held on June 23rd at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham. The debtor commenced trading on his own account in June, 1930, his main business being wiring work for new houses. He ascribed his failure to lack of capital and ill-health which prevented him from giving full time to the business. The statement of affairs showed a deficiency of £207 on liabilities of £219. The case was left in the hands of the Official Receiver as trustee.

J. E. Mills, 18, Goodhart Way, West Wickham, Kent, lately carrying on business at 25a, Hall Road, Peckham Rye, S.E., as F. W. Terry & Co., radio dealer. —This receiving order was made on the petition of a creditor, and according to the statement of affairs which has now been lodged by the debtor the gross liabilities amount to £4,318, of which £1,975 is expected to rank for dividend, with a deficiency of the same amount. The debtor attributes his failure to lack of working capital, to the gross profits being insufficient to cover overhead expenses, heavy interest and bank charges, bad debts, depreciation in the value of shares and to his liability for losses incurred as a result of terminated hire-purchase agreements.

H. M. Wise, electrical engineer and radio dealer, carrying on business at Corvedale Road, Craven Arms, Salop, under the style of H. M. Wise & Sons.—The public examination was held at the Town Hall, Leominster, recently. The statement of affairs filed showed gross liabilities of £1,636, of which £1,119 was expected to rank for dividend, with net assets of £895, leaving a deficiency of £224. Debtor attributed his failure to falling off of trade since the crisis of last September, competition, and heavy overhead expenses in relation to turnover. The examination was adjourned.

J. N. Hogg, 104, Allerton Road, and 16, Woolton Street, Woolton, both Liverpool, electrical engineer.—Debtor, who filed his own petition, has now returned a statement of affairs showing gross liabilities of £7,229, of which £4,754 is expected to rank for dividend. The assets are put down at £414, leaving a deficiency of £4,340. He ascribed his failure to losses on contracts through underestimating, excessive overhead expenses, the retention of unnecessary employees, expense of running various motor vehicles and to his neglect in not personally supervising the business. At the first meeting of creditors Mr. P. S. Booth, accountant, 2, Bixteth Street, Liverpool, was appointed to act as trustee of the estate, with a committee.

C. W. Simmons, radio engineer, 34, Brougham Hayes, Bath, Somerset.—The public examination was resumed recently at the County Court Offices, Abbey Street, Bath. It was reported that the liabilities amounted to £461. The Official Receiver reported that debtor had been ordered to produce further accounts, but the order had been only partially complied with. Invoices and receipts had been destroyed. The Registrar said the examination would be adjourned generally, with liberty to restore.

E. S. Raney, electrical engineer, 24, Pollards Nurseries, Bedford Road, Lower Stondon, Bedford, formerly residing and carrying on business at "Minstan," Coldyhill Lane, Newby, Scarborough.—Public examination July 14th at the Court House, Luton.

W. S. Scott (the West End Radio), radio engineer, 452, West Road, Newcastle-upon-Tyne.—Public examination July 28th at the Court House, Newcastle-upon-Tyne.

B. Harris (Central Radio), wireless dealer, 96, Harwood Road, Fulham, and lately carrying on business at 144, Kingsland High Street, E.8.—Application for discharge to be heard on July 13th at Carey Street, London, W.C.2.

H. A. Langlois (Electrical Installation Co., and/or Electrical Contracting Co.), electrical contractor, 2, Atlas Place, Cardiff; 22, Pocklingtons Walk, Leicester; 94, Rutland Street, Leicester; and Gartree Street, Leicester.—First and final dividend of 1s. 0¾d., payable June 28th at the Official Receiver's Office, 34, Park Place, Cardiff.

R. A. Bowles, radio dealer, 82, Oriel Drive, Aintree, Liverpool, lately residing and carrying on business at 2, Sefton Road, Litherland, Liverpool.—Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, released June 16th.

J. T. Eaton (X.L. Service Station), wireless dealer, 13, Bolton Road, Bury.—Application for discharge to be heard on July 19th at the Court House, Bolton.

J. W. Watson, electrical engineer, 154 Aldborough Road, Seven Kings, Essex.—First and final dividend of 2$\frac{11}{16}$d. in the £, payable June 29th at 29, Russell Square, London, W.C.1.

Company Liquidations

G. B. Industries, Ltd., 31, Christopher Street, E.C.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on June 21st at the Board of Trade offices, Carey Street, W.C. The Official Receiver reported that the company was formed in October, 1937, but did not commence business until about June, 1938, as it was originally intended that it should trade in American radio goods and negotiations for an English selling agency for such goods did not mature. In June, 1938, however, the company took over the sale of an electric razor of American manufacture. The razors were imported from America at a cost of four dollars each, but it was ascertained later that they were being imported under other names by other dealers and sold retail at less than the price charged. Later, an arrangement was entered into with another American company to sell their razor but the agreement fell through, and the company commenced an action for damages for breach of contract. The company's failure was attributed to the electrical firm refusing to comply with the terms of the contract and insufficient capital. There was no quorum present and the meetings were adjourned.

G. R. Powell, Ltd., electrical engineers, 15, Lansdowne Road, South Lambeth, S.W.8.—Observations pertaining to the winding-up of this company have been issued by the Official Receiver from the Companies Winding-up Department of the Board of Trade. The statement of affairs shows liabilities of £2,227 against assets of £994. The company's failure was attributed to the fact that it was able to obtain too much credit which permitted it to undertake contracts too large relative to its resources and also to overhead expenses being too heavy. The Court appointed Mr. D. R. Macdonald, Baker Street, W., liquidator of the company.

Erewash Electric Wire Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. L. Smith, 24, Walbrook, London, E.C.4.

The Rhondda Tramways Electric Supply Co., Ltd.—Meeting July 26th at 38, Kingsway, London, W.C.2, to receive an account of the winding-up by the liquidators, Messrs. E. A. Bond and T. H. Underhill.

W. R. Small, Ltd.—Winding up voluntarily. Liquidator, Mr. W. Le Resche Hand, of Hand & Co., 17, Cannon Street, Birmingham.

Britannia Radio and Television Co.—Meeting of creditors to be held July 3rd at 3, Salters Hall Court, Cannon Street, London, E.C.4, to nominate a liquidator and to appoint a committee of inspection for the purpose of winding up.

Sel-Ezi Wireless Supply Co., Ltd.—Claims to the liquidator, Mr. L. D. Woods, 150, Southampton Row, London, W.C.1, by July 22nd.

Meeting of Creditors

Kniveton Cable Works, Ltd.—A meeting of creditors will be held at 25, Queensway, Ponders End, Middlesex, on Thursday, July 6th.

Reports and Dividends

The Broadcast Relay Service, Ltd., is to make an issue of 200,000 5½ per cent. redeemable cumulative preference shares of £1 each at par, together with 200,000 ordinary shares of 5s. each at 6s. per share. This decision was made at an extraordinary meeting on Monday. At the annual general meeting which preceded it, Sir H. Brent Grotrian, the chairman, said that the company attached great importance to the Postmaster-General's announcement that "power would also be taken in the licences for wireless relay exchanges (which are being extended for a period of ten years from December 31st, 1939) to require the exchanges to be connected by wire with a B.B.C. station, thus enabling programmes to be transmitted, if so desired, entirely by wire." They would now be able to offer subscribers a service hitherto unattainable, with freedom from atmospheric or other disturbances. The directors did not think that the proposed new Post Office relay service would conflict with the operations of the company as it would necessitate a subscriber having both a telephone and a wireless set. Only a very small percentage of the company's subscribers had telephones. Moreover, it would be superfluous for the Post Office to initiate a service of such a kind as this in areas where an an efficient alternative wired service was in operation. With regard to the defence aspect of the company's service, it was possible with certain additions of plant in its stations, for the service to continue to operate independently of both electricity mains and the telephone exchanges in the event of damage to either.

The North Metropolitan Power Station Co., Ltd., which was formed in 1926 to construct and acquire generating stations and lease them to the Northmet Power Co., the parent company, is making an issue at 91½ per cent. of £1,700,000 3½ per cent. second mortgage debenture

stock. Lists opened and closed last Wednesday.

Philips Incandescent Lamp Works (of Eindhoven) reports a profit of 8,038,591 fl. for the year ended April 30th last, an increase of 23,284 fl. over the preceding year's figure. The directors state that the results can be considered satisfactory in view of the international difficulties and tensions prevailing during the past year. As a result of these conditions it was deemed necessary to add further important amounts to the reserve for risks on foreign exchanges. Moreover, the special reserve for extensions had been increased by 1,000,000 fl. and closed last Wednesday.

The Revo Electric Co., Ltd., held its annual meeting on June 21st when Mr. B. Silcock (chairman), who presided, said that up to a few months ago they were hoping that the profits earned in their record year to March, 1938, would be maintained, but owing to the international crisis which subsequently occurred, and which affected business confidence in the country for the time being, orders temporarily dropped, and in addition there was a rise in costs. In spite of these factors their total sales had been in excess of those of last year. In addition to the expansion of the production of their normal products, they were also engaged on work of national importance in connection with A.R.P. schemes, lighting equipment in camps, munition factories and aerodromes, and in the production of switchgear for the Army, Navy and Royal Air Force. Electrical equipment necessarily largely followed electrical power output, and in the electrical fitting branch of their business they were making satisfactory progress.

Newton Brothers (Derby), Ltd.—Presiding at the annual meeting on June 21st Mr. P. C. Cooper-Parry (chairman) said that the net profit for the year showed a satisfactory increase over the previous year and was the result largely of the added output which had been obtained by considerable plant additions and re-equipment and by continued works reorganisation consequent on a prudent dividend policy over the past three years. As to the prospects for the coming year, from evidence of orders on hand, the state of trade generally and inquiries coming through he saw no reason why trading results should not approximate those now disclosed. With regard to the proposal to distribute one fully-paid ordinary share of 2s. for each 2s. share held, the directors were pleased to be able to make this recommendation and so restore to shareholders a fractional part of the heavy capital reduction of some time ago.

At an extraordinary meeting which followed, approval was given to resolutions authorising the bonus issue of shares.

The Globe Telegraph & Trust Co., Ltd.—Speaking at the annual general meeting of the company on Monday the Earl of Midleton, chairman, said that the past year had been difficult for the investor and until world affairs were more settled it was difficult to visualise any great improvement. The company's main holding, Cable & Wireless, Ltd., appeared, however, to be in a very sound position and they could look forward with confidence, in the absence of any catastrophe, to a continuance of a reasonably good income.

The United River Plate Telephone Co., Ltd., reports net earnings for 1938 of £641,438, as compared with £585,704 for the preceding year, before deducting loss of £34,146 on exchange. The final ordinary dividend is 3 per cent., maintaining the distribution for the year at 4 per cent. The balance carried forward after transferring from capital surplus £172,140 (realised appraisal increment) is raised from £1,047,049 to £1,358,082. There was a net gain of 26,283 telephones in service during the year, making the total 361,468.

The East African Power & Lighting Co., Ltd., reports a net revenue of £91,768 for 1938, as compared with £84,914 in the preceding year. A sum of £23,511 (£19,532) goes to depreciation, £5,000 (same) to general reserve and £800 (nil) to preliminary development account. The preference dividend takes £21,000 and a final dividend of 4 per cent., making 7 per cent. (same), leaves £13,579 (£10,272) to be carried forward. Sales of electricity in Kenya increased by 8.67 per cent. and since close of year a favourable extension of tenure of company's distributing and generating licences in Nairobi and district has been granted. Undertakings in Tanganyika Territory continued to operate on a satisfactory basis. In Uganda, power stations and distribution systems supplying Kampala, Entebbe and Jinja have been in service for some twelve months, and results to date are encouraging.

The Mid-Lincolnshire Electric Supply Co., Ltd., reports a net profit for 1938 of £51,008 (against £45,225 for 1937). The final ordinary dividend is 5 per cent., making 8 per cent. for the year (same), and £2,081 is carried forward (against £1,484 brought in).

Silentbloc, Ltd., has declared a final ordinary dividend of 6d. per share, making 50 per cent., less tax (same), for the year. For the previous year a bonus of 2d. (8⅓ per cent.) per share was paid.

The West Kent Electric Co., Ltd.—Underwriting took place on June 15th in connection with an issue of 500,000 4½ per cent. £1 preference shares at 20s. 6d. The money will be utilised to finance further developments in the area served by the company.

The Young Accumulator Co., Ltd., reports a trading profit for the year ended March 31st of £14,808, which with other revenue, makes £15,528, as compared with £11,334 in the preceding year. The net profit is £7,718 (against £6,923), and the dividend for the year is 5 per cent., less tax (against 3½ per cent.). The balance carried forward is £5,222 (against £4,518 brought in). The report states that the turnover continued to expand and was again the highest ever reached in any year. Meeting: July 3rd.

The Wessex Electricity Co., Ltd.—Lists will be opened to-day (Friday) for a £1,500,000 issue of 3¾ per cent. debenture stock, dated 1954-59, at 96.

Ruston & Hornsby, Ltd.—At the annual meeting last Tuesday Mr. G. R. Sharpley, chairman and managing director, said that there had been a further improvement in the volume of goods dispatched. The figures for the year had been only slightly affected by rearmament work, equipment supplied to the Government amounting to only 6 per cent. of the total. Marine engine business had suffered a setback, but it was hoped that a strong recovery would follow the recent Government decision to subsidise the shipbuilding industry. The company's general oil engine business showed a welcome advance. Competition of certain Continental countries could only be combated by collective action and a carefully-thought-out Government policy.

Newman & Watson, Ltd.—Mr. A. A. B. Walford, chairman, stated at the annual meeting on Tuesday that the directors considered the trading results satisfactory, particularly in view of the fact that the crisis last September had almost stopped the placing of orders. If things went on in the normal way, prospects looked favourable, and although competition was very keen, generally speaking they were holding their own.

Hick, Hargreaves & Co., Ltd., held its annual meeting on Tuesday. Mr. W. D'Arcy Madden, chairman and managing director, reported that all departments of the works had been fully employed, but, notwithstanding the large amount of work in hand, the turnover was 3 per cent. lower. This was due to a considerable reduction in the repair work carried out, which is necessarily a fluctuating business. This reduction had, however, been largely offset by increased turnover of the turbine department. Important orders obtained included 30,000-kW condensing plants and feed heating equipment authorised by the Central Electricity Board for the Corporations of Newport, Cardiff, Bolton and Portsmouth. Orders in the rotary compressor department showed an increase of 15 per cent. Two important contracts were in hand for the War Office. Considerable expenditure had been incurred in meeting the requirements of the Factories Act, and the equipment of the works was being continually improved and extended.

The Telegraph Condenser Co., Ltd., is deferring the payment of dividends on the preference shares due on December 31st, 1938, and June 30th, 1939, until the accounts to January 2nd, 1940, have been audited.

The Atlas Electric and General Trust, Ltd., reports a net revenue of £179,329 for the year ended March 31st last, as compared with £192,664 in the preceding year. To this is added £75,546 brought forward, making £251,875. The dividend on the 7½ per cent. cumulative ureference shares absorbs £155,531, leaving £96,344 to be carried forward. No ordinary dividend has been paid since that for 1932-33. Although gross receipts of the subsidiary company, the Sociedad Comercial de Montevideo, increased by more than 11 per cent., expenses were also higher, and the revenue account showed a net loss of $261,091 ($459,297), increasing the debit balance carried forward to $839,244. No provision for this loss is made in the accounts of the trust.

British Industrial Plastics, Ltd.—An interim report states that for the six months ended March 31st profits were somewhat above those for the corresponding period of last year. Since then sales of moulding powder had shown no signs of the severe recession that took place last summer. Sales of other plastic products continued to increase, and now made a substantial contribution to the revenue of the company. Competition in the moulding industry was as acute as ever, but unless some material change took place, profits should show an increase over those for last year.

The Brazilian Traction, Light & Power Co., Ltd., is to leave the question of a dividend in abeyance, owing to restrictions in the movement of funds from Brazil.

A. C. Cossor, Ltd., are paying a dividend of 6 per cent., actual, less tax, on the ordinary shares for the year ended March 31st, the first since registration as a public company.

Greenwood & Batley, Ltd., report a profit for the year ended March 31st of £105,467, as compared with £104,362 in the preceding year. The final ordinary dividend is 12 per cent., making 15 per cent. for the year, and £32,510 is carried forward (against £29,830 brought in). For the previous year the dividend on the ordinary shares was 10 per cent., plus a bonus of 5 per cent.

George Kent, Ltd., have announced a final dividend of 7 per cent., less tax, making 10 per cent. for the year (same), plus a bonus of 2½ per cent. (against 3½ per cent.).

The Brixham Gas & Electricity Co., Ltd., is selling by tender £28,956 £1 4½ per cent. redeemable preference shares.

Sterling Industries, Ltd. (formerly Ismay Industries, Ltd.), are not to make any payment at present on their 5½ per cent. preference shares.

The Electric & General Investment Co., Ltd., reports a net profit for the year ended May 31st of £4,263, as compared with £3,910 for the previous year. The final dividend is 5 per cent., less tax, making 7½ per cent. for the year (same), plus a jubilee bonus of 2½ per cent. The balance carried forward is £19,458 (against £19,545 brought in).

Mirrlees, Bickerton & Day, Ltd., report a net profit of £23,672 for the year ended March 31st as compared with £19,639 for the previous year. The ordinary dividend for the year is 6 per cent. (against 4 per cent.), and £5,578 is carried forward (against £5,008 brought in).

Japanese Convention

A CORRESPONDENT in the Far East reports that the Japanese Electrical Association recently held a four-day convention in Tokyo which was attended by about 2,000 members. The Government was represented by the Chief of the Electricity Board. In conjunction with the convention an exhibition of substitutes for electrical apparatus and materials was held. During the convention the subjects discussed included the use of substitute materials, means of increasing the supply of electric power, laying a 6,600-V oil-insulated cable, high-frequency insulation materials, inorganic insulated wire and glass fibre wire, aluminium cast rotors and high-frequency electric furnaces.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets are too much under the influence of international politics for them to respond to such satisfactory company reports and cheerful shareholders' meetings as these times still permit. The position in Japan became so threatening in the early part of the week as to bring Stock Exchange business to something like a standstill. A number of new issues are ready to be presented for public subscription directly the times appear auspicious. A few of the best class offers find no difficulty in securing support from the public, but in the absence of investment or speculative enterprise, a large number of intending new issues are held back.

All things considered, prices show a reasonable degree of firmness. People are not selling their investments; though, on the other hand, fresh demand is meagre. Until fresh light is thrown upon the tangled situation in the Far East, Stock Exchange markets can hardly hope for an improvement in the present state of affairs, though it is unquestionable that the receipt of what is vaguely called good news, would at once bring about a complete change in the complexion of markets.

Two New Issues

The North Metropolitan Power Station Co. has issued this week £1,700,000 second debenture stock, bearing 3½ per cent. interest, at 91½; the redemption date is 1965. The stock was bought by Baring Brothers & Co., at 89, the latter firm paying underwriting and overriding commission and expenses. The price compares favourably with the market quotations for the company's three previous classes of second debenture stock with which the newcomer will rank *pari passu*. Another applicant about to appeal for public subscription is the Wessex Electric Supply Company—an Edmundson's subsidiary. In this case 1½ million pounds of 3¾ per cent. debentures will be offered at 96. The gilt-edged market is a little staggered by the magnitude of a new L.C.C. 3½ per cent. stock; 7½ million pounds (at 96½) will require strong powers of digestion.

West Kent Preference

The issue of half-a-million 4½ per cent. preference shares by West Kent Electric was well absorbed. The biggest applications were understood to have been scaled down. Dealings are taking place on the basis of par to 3d. premium over the prospectus price of 20s. 6d., and shares can be bought in the shape of renounced allotment letters, free of stamp duty on the transfer. The yield of £4 6s. 9d. per cent. is a shilling or two higher than on some of the other low-priced electricity supply preference shares, but in line with the less popular high-priced issues. Northmet Power 4 per cents., at 20s. 6d., for instance, yield only £3 18s. 6d. per cent. The same company's 6 per cent. shares, however, which rank equally but stand at 8s. over par, give approximately the same yield as on the new West Kent issue. Dividends on the latter require £22,500 annually, against £67,400 profits available last year. A first dividend payment of about 2d. per share is due next February.

A.P.D.

Few complaints are heard in the markets concerning the new Armaments Profits Duty, although critics carp against the duty in principle, and pick holes in the details. But from the point of view of company profits and dividends, the tax has been accepted with something akin to indifference. In those quarters where the duty is calculated to fall the heaviest, prices had, in any case, receded in advance of the expected blow. The latter proving mild in character, prices were, in the event, little affected.

For calculating the increase in profits liable to the tax, most companies are allowed to take the earnings of 1935 or 1936—or the average of either of these years with 1937—for the starting point. The 60 per cent. duty will fall on the increase of profits above that standard, but only on that part of the increase which can be attributed to armament work. The standard with which comparison is to be made is considered generous enough, for profits in the years in question were running generally at a very respectable level. And the duty itself, allowing for the saving in income-tax and N.D.C., is equal in practice to nearer 40 than 60 per cent.

Individual Cases

Sub-contractors come into the A.P.D. net, but there is some dissatisfaction that, in limiting the incidence to companies doing at least £200,000 worth of armament work in a year, some of the small concerns, making as fat profits as any, may come away unscathed. Apart from these considerations, reassurance is found in the conservative dividend policies followed by practically all the big armament concerns. Most of these companies could afford to see a bigger fall in earnings than seems to be in store, before a cut in the dividend became called for. Without knowing the proportion between the profits on a company's armament and civil business, calculation of the liability in individual cases is impracticable. Generally speaking, it is supposed that nearly all the electrical equipment undertakings will be called on for a contribution. The prospect, however, is not calculated to cause tremors among the shareholders.

Wireless

A. C. Cossor was incorporated last year and now declares a maiden dividend of 6 per cent. With the 5s. shares at around 3s. 6d. the yield comes to over 8½ per cent.—a return which looks high by some standards, but moderate in comparison with, for instance, over 13 per cent. on Pye deferred. Apart from the production of the well-known wireless sets and components, the company makes a wide range of other electrical apparatus, and is said to be very well occupied with work for the Government. Sterling Industries, formerly known as Ismay Industries, announce that there will be no payment on the 5½ per cent. preference shares on July 1st. There have been a few further reactions to the Post Office scheme for telephone broadcasts. Broadcast Relay Services improved to 9s. 3d. ex dividend after the meeting. E. K. Coles sagged from 5s. to 4s. 6d., and Electric and Musical Industries from 10s. 3d. to 9s. 9d. Before long the Television Advisory Committee will report to the Postmaster-General on the question of extending the television service to the provinces.

Telephone Shares

Generally speaking, shares in the companies manufacturing telephone equipment stand high in the investor's estimation. Their appeal lies, it seems, in the consistently busy conditions of the industry, and in the reliability and enterprise of the main source of demand. Post Office activity is held to assure a regular flow of orders for a long way ahead. Only the armament manufacturers, it is considered, can feel greater assurance about the regularity of work: and armament work is plainly a less satisfactory occupation than the civil variety. Most of the companies have other irons of importance in the fire, and, because of their particular equipment, are probably doing a useful amount of armament work in addition to the chief interests. Among the best known enterprises in the field, the shares of the following trio show the moderate yields which signify the confidence of investment:—

Share	Price	Dividend	Yield %
		%	£ s. d.
Ericsson Telephones, 5/-	41/3	25	3 0 6
		tax free	net
Automatic Telephone & Elec., £1	47/6	12½	5 5 3
Telephone Manufacturing, 5/-	9/6	9	4 14 9

Other companies doing work for the Post Office include Hall Telephones, British Insulated Cables, Siemens, General Electric and Chloride Electrical Storage.

Post Office Expansion

An idea of the scope for the telephone manufacturing companies is given by the Post Office and Telegraph (Money) Bill. This seeks the authorisation of a further £40 millions of capital for the development of the various systems—of which the telephone service would take the lion's share. This sum, together with a comparatively small amount in hand, is calculated to cover requirements, at the present rate of expenditure, until March, 1941. It marks an increase of £9 million over the amount spent in the two previous years. The industry works under particularly good conditions because of the system of co-operation between the Post Office and the principal manufacturers. All patents are pooled, for instance, and one standard is adopted in the very complex plant which comprises the automatic telephone system. Also, the steady continuity of orders makes it possible for the makers to plan for years ahead. These points were made at the last annual meeting of the Ericsson Telephone Company. Revision of the agreements on Post Office contracts is at present under discussion.

Revo Electric

From the chairman's review at the annual meeting of Revo Electric it seems that the company shared the experience which the year 1938-9 has made familiar to shareholders in numerous other enterprises. International events, and their repercussions on business confidence, spoilt the chance of equalling the record figures of the previous year. All the same, the decline in profits was moderate enough to allow the 17½ per cent. dividend to be maintained, and the total sales were actually up on the year. The price of the shares has fallen this year from a high point of 35s. 6d. to 29s., at which the yield is a few pence over 6 per cent. With the demand for electrical equipment following the course of electrical power output, the fittings side of the business made progress during the year, while, apart from normal work, the company is supplying lighting and switchgear equipment for the defence forces. It has been possible to embark on fresh capital expenditure without depriving the business of ample financial resources.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 Highest	1939 Lowest	Dividend Previous	Dividend Last	Price June 27	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	63/9	−⅛	4 14 4
British Power & Light	30/9	26/–	7	7	28/6	—	4 18 3
City of London	33/9	31/–	7½	7½	31/6	−6d.	4 15 3
Clyde Valley	37/9	34/–	8	8	37/–	—	4 6 6
County of London	46/9	41/9	10½	10½	44/–	—	4 15 5
Edmundson's:							
7% Pref.	31/6	30/–	7	7	30/6	—	4 11 10
Ord.	27/9	23/–	9	6	25/9	—	4 13 2
Elec. Dis. Yorkshire	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	48/–	12	12	49/–	—	4 18 0
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/–	7½	7½	30/9	—	4 17 7
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric	29/3	26/3	7	7	26/3	—	5 6 8
London Electric	34/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red.	106½	102½	5	5	104	−½	4 16 2
Metropolitan	51/–	45/3	12	12	47/6	—	5 1 0
Midland Counties	38/9	34/–	8	8	37/6	−6d.	4 5 3
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric:							
Ordinary	32/3	28/6	7	7	31/–	—	4 10 4
7% Pref.	32/6	30/–	7	7	31/6	—	4 9 0
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	13	6	6	12¾	—	4 14 1
Northmet Power:							
Ordinary	46/6	41/6	10	10	44/6	—	4 10 0
6% Pref.	29/–	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	36/3	—	4 8 2
Southern Areas	22/9	19/6	4½	5	20/6	—	4 17 7
South London	30/9	28/–	7	7	28/–	—	5 0 0
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	37/–	—	4 6 6
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/9	—	—
Calcutta Elec.	39/–	31/–	10*	10*	30/6	—	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power	26/3	22/6	7	7	24/–	—	5 16 8
Jerusalem Elec.	24/6	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	28/6	8*	8*	26/3	—	5 6 2
Montreal Power	34½	31	1½	1½	34½	−½	—
Palestine Elec. "A"	29/6	26/3	7½*	7½*	23/9	−⅛	6 6 4
Perak Hydro-electric	18/9	15/–	7	6	15/9	—	7 12 4
Shawinigan Power	23½	20	85cts.	83cts.	21	−¼	—
Tokyo Elec. 6%	61	50	6	6	48½	—	12 7 6
Victoria Falls Power	72/–	60/–	13½	15	68/9	−⅛	4 7 3
Whitehall Investments Pref.	19/6	16/–	7½	7½	19/–	—	7 17 0
Public Boards							
Central Electricity:							
1950–70	112	106	5	5	110	—	4 11 0
1955–75	115¼	108	5	5	110	—	4 11 0
1951–73	106½	103¼	4¼	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	91½	—	3 16 6
London Elec. Trans. Gtd.	88½	84	2½	2½	86½	—	2 17 6
London & Home Counties, 1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport:							
A	114½	104¾	4½	4½	105½	−3	4 5 4
B	117½	105	5	5	108½	−4	4 12 2
C	83¾	64½	4½	4	79½	—	5 0 8
West Midlands Joint Elec., 1948–68	112½	109	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	170½	—	5 5 5
Anglo-Am. Tel.:							
Pref.	101½	89½	6	6	95½	+1	6 5 8
Def.	23¾	19	1½	1½	23	—	6 10 4
Anglo-Portuguese	24/–	19/9	8	8	20/–	−⅛	8 0 0
Cable & Wireless:							
5½% Pref.	95½	75	4½	5½	89½	−1	6 3 0
Ord.	55	34	4	4	50½	−1	7 18 5
Income	100	95½	—	—	98	—	4 1 8
Canadian Marconi $1	5/6	3/9	—	Nil	5/3	+6d.	—
Globe Tel. & Tel.:							
Ord.	31/3	23/6	7½*	7½*	30/–	+⅛	5 0 0
Pref.	26/9	23/3	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)	38	27½	20	20	30½xd.	−½	6 11 0
Inter. Tel. & Tel.	10½	7½	Nil	Nil	7½	—	—
Marconi-Marine	30/–	23/–	7½	10	28/9	—	6 19 4
Oriental Telephone Ord.	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8½	6	8	6	7	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	8/6	6	6	9/6	—	3 3 2
Western Union	25½	19½	2½	—	20½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	7/6	3/6	Nil	Nil	6/3	—	—
4% Inc.	16	7	Nil	Nil	13	—	—
British Electric Traction:							
Def. Ord.	1025	700	5	5	850	—	—
Pref. Ord.	164	158	8	8	155	—	5 3 3
Bristol Trams	48/6	37/3	8	10	47/–	−6d.	4 5 2
Brazil Traction	13	7⅞	$1	50c.	9⅛	−⅜	—
Calcutta Trams	25/6	23/6	8	8	22/–	—	7 5 6
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	35/–	+½	5 14 3
Mexican Light:							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	75	+5	6 13 4
Southern Rly:							
5% Prefd.	75½	48	5	5	72	−1	6 19 0
5% Pref.	99½	80	5	5	94½	−1	5 5 9
T. Tilling	48/3	39/6	10	10	45/–	−⅛	4 9 7
Tilling & B.A.	53/–	50/–	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	36/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	28/9	—	10 8 8
Assoc. Elec.:							
Ord.	45/3	34/9	10	10	39/–	—	5 2 7
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	46/6	39/3	10	12½	47/6	—	5 5 3
Babcock & Wilcox	42/9	37/–	10	12½	44/6	—	5 12 4
British Aluminium Ord.	58/3	48/9	12½	12½	56/3	−⅛	4 9 0
British Insulated Ord.	88/–	77/–	20	20	78/9	−⅛	5 2 0
British Thermostat (5/–)	16/–	12/–	18½	18½	13/9	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	18/6	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/3	−3d.	—
Callender's	92/–	67/6	20	15	62/6	−½	4 15 10
Chloride Elec. Storage	82/3	65/–	20	15	3½	—	4 12 4
Consolidated Signal	96/–	80/9	36½	36½	82/6	−⅛	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	23/9	—	7 7 4
Crompton Parkinson:							
Ord. (5/–)	21/–	14/9	12½	15	18/9	−⅛	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	4/6	−6d.	—
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	9/9	−6d.	5 2 7
Electric Construction	38/6	30/6	12½	13½	37/6	—	7 4 0
Enfield Cable Ord.	58/6	2½	25	16½	53/9	—	6 0 10
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/–	30/3	10	10	34/6	—	5 16 1
Ensign Lamps (5/–)	14/6	13/9	—	25	14/6	+3d.	8 12 6
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	41/3	—	3 0 6
Ever Ready (5/–)	24/–	19/3	35	30	19/6	—	7 14 0
Falk Stadelmann	27/–	21/–	10	10	22/6	—	8 18 0
Ferranti Pref.	25/6	23/6	7	7	22/6	—	6 4 5
G.E.C.:							
Pref.	31/0	29/3	6½	6½	31/3	—	4 3 2
Ord.	82/–	70/9	17½	20	75/6	—	5 6 0
Greenwood & Batley	27/6	24/6	7	15	28/3	−6d.	10 12 4
Hall Telephone (10/–)	22/3	19/3	15	15	21/3	—	7 1 2
Henley's (5/–)	21/–	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/–	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	46/3	37/3	12½	15	43/9	+6d.	6 17 0
India-Rubber Pref.	21/–	20/–	5½	5½	21/3	—	5 3 6
Intl. Combustion	120/–	97/–	32½	32½	5⅞	—	5 9 5
J. Lucas	60/–	52/–	15	15	57/6	—	5 4 4
Johnson & Phillips	41/3	32/–	12½	12½	40/–	—	6 5 0
Lancashire Dynamo	68/–	60/–	25	25	62/6	—	8 0 0
Laurence Scott (5/–)	12/–	10/–	15	15	10/6	−6d.	7 2 10
London Elec. Wire	31/6	29/–	12	7½	28/9xd.	—	5 4 4
Mather & Platt	50/–	42/6	13½	13½	47/–	−⅛	5 15 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	76/3	—	5 5 0
Pye Deferred (5/–)	13/9	7/6	25	25	9/6	—	13 3 2
Revo (10/–)	35/6	29/–	17½	17½	29/–	—	6 0 8
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–)	5/6	4/9	5	10	4/6	—	11 2 0
S. Smith (1/–)	9/9	6/–	37½	50	8/9	—	5 14 3
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/6	—	8 0 0
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–)	10/–	8/–	9	9	9/6	—	4 14 9
Tube Investments	91/–	82/9	23¾	23¾	87/6	—	5 9 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	19/–	10	10	18/6	−3d.	5 8 1
Westinghouse Brake	54/9	43/9	17½	17½	48/9	—	7 3 5
Walsall Conduits (4/–)	31/9	24/–	55	55	27/–	—	8 3 0
West, Allen (5/–)	7/6	5/9	7½	10	6/9	—	7 8 2

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

14120. "Arc discharge arrangements for converting electric current." T. Hamilton Adams. December 1st, 1937. (506788.)

23984. "Electrical safety switching-devices for use on vehicles or aircraft." P. W. Dunn. September 2nd, 1937. (506725.)

32289. "Accumulators." H. G. Andre. December 28th, 1936. (Addition to 491782.) (506731.)

32348. "Ultra-short wave thermionic systems." Telephone Manufacturing Co., Ltd., L. H. Paddle and C. C. Whitehead. November 24th, 1937. (506639.)

32369. "Suppression of radio interference from portable domestic appliances." British Thomson-Houston Co., Ltd., and T. H. Kinman. November 24th, 1937. (Cognate application 35707/37.) (506732.)

32691. "Frequency convertors and circuits therefor." F. H. Stieltjes. December 4th, 1936. (506790.)

32727. "Amplifying systems using negative feedback." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). November 26th, 1937. (Convention date not granted.) (506791.)

32911. "Manufacture of coils for electrical purposes." Marconi's Wireless Telegraph Co., Ltd. November 28th, 1936. (506516.)

32912. "Electric wave filters." Marconi's Wireless Telegraph Co., Ltd. November 28th, 1936. (506517.)

32913. "Short-wave transmitting aerial systems." Telefunken Ges. für Drahtlose Telegraphie. November 28th, 1936. (506518.)

32929. "Electric-discharge devices." British Thomson-Houston Co., Ltd. November 30th, 1936. (506519.)

32930. "Methods of making vacuum-tight connections between ceramic bodies and other ceramic or metal bodies." British Thomson-Houston Co., Ltd. November 30th, 1936. (506520.)

32932. "Electric motors." British Thomson-Houston Co., Ltd., A. H. Maggs and S. U. A. Choudhury. November 20th, 1937. (506521.)

32940. "Means for producing and utilising certain electrical conditions in the ionosphere." V. A. Bailey. November 27th, 1936. (506522.)

32942. "Resistance-welding apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 14th, 1936. (506644.)

32957. "Electro-magnetic devices for performing switching and the like operations." W. T. Henley's Telegraph Works Co., Ltd., E. Moor and H. S. Wheeler. November 29th, 1937. (506523.)

32981. "Flameproof rheostatic and like resistances for use in mines." C. T. Scarf, F. Crowther and Metropolitan-Vickers Electrical Co., Ltd. November 29th, 1937. (506529.)

32987. "Gas-tight junctions between lead-in wires or conductors and ceramic parts in electric discharge devices." Telefunken Ges. für Drahtlose Telegraphie. November 28th, 1936. (506530.)

33142. "Electric wave filters." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1936. (506541.)

33143. "Thermionic amplifiers." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1936. (506542.)

33144. "Indicators, particularly for radio receivers." Marconi's Wireless Telegraph Co., Ltd. November 30th, 1936. (506543.)

33175. "Electrode constructions for electron-discharge tubes." W. Ehrenberg and S. Hill. December 1st, 1937. (506794.)

33176. "Indicators, particularly for wireless receiving apparatus." Telefunken Ges. für Drahtlose Telegraphie. December 1st, 1936. (506648.)

33184. "Telephone instruments." Ericsson Telephones, Ltd., and F. Hollis. December 1st, 1937. (506430.)

33202. "Electron-discharge tube amplifiers." Standard Telephones & Cables, Ltd., R. M. Barnard and A. H. Roche. December 1st, 1937. (506652.)

33207. "Electric motor control systems." English Electric Co., Ltd., and H. S. Carnegie. December 1st, 1937. (506742.)

33249. "Keying circuit arrangements for radio and like transmitters." Marconi's Wireless Telegraph Co., Ltd., and H. J. H. Wassell. December 1st, 1937. (506658.)

33250. "Cathode-ray tubes and method of manufacturing the same." Marconi's Wireless Telegraph Co., Ltd., and L. M. Myers. December 1st, 1937. (506798.)

33251. "Remote-control systems for volume or gain control of electron-discharge device amplifiers." Marconi's Wireless Telegraph Co., Ltd., and A. L. Oliver. December 1st, 1937. (506659.)

33252. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., and W. T. Ditcham. December 1st, 1937. (506660.)

33253. "Radio direction finders." Marconi's Wireless Telegraph Co., Ltd., and R. J. Kemp. December 1st, 1937. (506743.)

33254. "Electron-multiplier discharge tubes." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. December 1st, 1937. (506661.)

33267. "Engine-driven electric-generator sets for emergency lighting and similar purposes." T. B. Somerville, A. G. Williamson, and Metropolitan-Vickers Electrical Co., Ltd. December 1st, 1937. (506664.)

33268. "Protective systems for electric induction furnace installations." P. G. H. Burbridge, G. F. Travis, R. H. Black, and Metropolitan-Vickers Electrical Co., Ltd., and Electric Furnace Co., Ltd. December 1st, 1937. (506665.)

33275. "Microphones." F. W. Alexander and D. E. L. Shorter. December 1st, 1937. (506668.)

33299. "Manufacture of electrodes for use in electron-discharge devices." J. D. McGee. December 2nd, 1937. (506800.)

33372. "Automatic control of the speed of electrically driven winding reels." British Thomson-Houston Co., Ltd., and R. G. Rayden. December 2nd, 1937. (506671.)

33406. "Self-winding reels for flexible electric conductors." P. L. Dadina. December 2nd, 1937. (506750.)

33515. "Oscillation exciter for oscillating apparatus." I. G. Farbenindustrie Akt. Ges. December 3rd, 1936. (506758.)

33537. "Electrical insulation." Distillers Co., Ltd., and H. T. Stanley and H. M. Staudinger. December 3rd, 1937. (506812.)

33554. "Loading coils." Standard Telephones & Cables, Ltd., and C. W. S. Green. December 3rd, 1937. (Addition to 461260.) (506764.)

33556. "Type-printing telegraph apparatus." Creed & Co., Ltd., and F. P. Mason. December 3rd, 1937. (506814.)

33557. "Amplifiers for electrical signalling systems." Standard Telephones & Cables, Ltd., and A. H. Roche. December 3rd, 1937. (506765.)

33875. "Electrotherapeutic apparatus." Associated P.A. Equipments and B. Denny. December 7th, 1937. (506544.)

34068. "Electrical socket contacts." C. L. Arnold and M. K. Electric, Ltd. December 9th, 1937. (506546.)

34546. "Electric cables." Norddeutsche Seekabelwerke Akt. Ges. December 14th, 1936. (506547.)

34615. "Voltage-sensitive electrical circuit arrangements and electrical voltage-controlling systems." Invex Corporation. December 14th, 1936. (506681.)

35237. "Electrical apparatus incorporating photo-sensitive cells." Foster Instrument Co., Ltd., and A. Douglas. December 20th, 1937. (506596.)

1938

2022. "Choke coils for use in electric power distributing systems." G. Ellison, Ltd., and J. Anderson. January 21st, 1938. (506601.)

2098. "Modulating circuit arrangements for high-frequency magnetron oscillators." Siemens & Halske Akt. Ges. January 21st, 1937. (506439.)

2703. "Tuning inductances for high-frequency circuits." Hazeltine Corpn. February 16th, 1937. (506602.)

2704. "High-frequency oscillators." Hazeltine Corpn. February 16th, 1937. (506603.)

7085. "Television scanning disc." Radioakt. D. S. Loewe. March 8th, 1937. (506691.)

8032. "Insulating and dielectric compositions." British Thomson-Houston Co., Ltd. March 18th, 1937. (506560.)

9174. "Gas-tight seals whereby electric conductors pass into a vitreous envelope." General Electric Co., Ltd., R. L. Breadner and V. J. Francis. March 25th, 1938. (506562.)

10142. "Apparatus for producing pictures of layers of the body by means of X-rays." Siemens-Reiniger Werke Agt. Ges. May 3rd, 1937. (506563.)

10336. "Electric governors." Harland Engineering Co., Ltd., and N. Worobjeff. April 4th, 1938. (506564.)

11834. "Cathode-ray tubes." Farnworth Television Inc. April 27th, 1937. (506454.)

12445. "Electric cable sheathings." Felten & Guilleaume Carlswerke. May 15th, 1937. (506607.)

14768. "Electrical earth-inductor navigating or flight instruments." Sperry Gyroscope Co., Inc. May 18th, 1937. (506458.)

17815. "Electric heating of glass." Soc. Anon. Manufactures des Glaces et Produits Chimiques de St. Gobain Chauny et Cirey. June 15th, 1937. (506696.)

18981. "Method of treating electrolytic coatings on magnesium and magnesium alloys." R. W. Buzzard. June 29th, 1937. (506466.)

20556. "High - pressure metal-vapour electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 13th, 1937. (506469.)

23389. "Producing iron sheets for laminated electric transformer cores." A. Canzler and Eisen-und Huttenwerke Akt. Ges. August 8th, 1938. (506474.)

23528. "Tuning inductances for high-frequency circuits." Hazeltine Corpn. February 16th, 1937. (Divided out of 506602.) (506620.)

23639. "Circuit arrangements for gas or vapour-filled high-voltage electric rectifiers." Patentverwertungs Ges. Hermes. August 10th, 1937. (506475.)

23738. "Electric measuring instruments." British Thomson-Houston Co., Ltd. August 13th, 1937. (506476.)

23943. "Circuit arrangements for phase comparison and bearing-finding radio receivers incorporating the same." Telefunken Ges. für Drahtlose Telegraphie. August 14th, 1937. (506621.)

24894. "Electric condensers." Aerovox Corpn. April 7th, 1938. (506478.)

26050. "Arrangement for separating synchronising impulses in television systems." R. J. Berry (C. Lorenz Akt. Ges.) September 6th, 1938. (506709.)

26385. "Electro - acoustic devices." Standard Telephones & Cables, Ltd. October 6th, 1937. (506480.)

28491. "Selecting switches of the kind used in communication systems." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. September 30th, 1937. (506483.)

29133. "Automatic teleprinter exchange systems." Standard Telephones & Cables, Ltd. October 15th, 1937. (506572.)

29740. "Telegraph systems." Marconi's Wireless Telegraph Co., Ltd. October 16th, 1937. (506573.)

31147. "Electric lamp connecting devices." J. Buser. February 2nd, 1937. (Divided out of 3277/38.) (506710.)

36218. "Directional radio receiver systems." Telefunken Ges. für Drahtlose Telegraphie. December 11th, 1937. (506630.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Argentina.—BUENOS AIRES.—July 24th. National Sanitation Works Department. Eleven transformers. (T. 23602/39.)*

Australia.—MELBOURNE.—August 2nd. Victorian Railway Commissioners. Battery charging equipment. (T. 23332/39.)*

July 4th. Postmaster-General's Department. Automatic telephone switching equipment. (T. 23549/39.)*

August 8th. Posts and Telegraph Department. Gas-filled, arrestor-type cable terminal boxes. (T. 23947/1939.)*

October 3rd. State Electricity Commission of Victoria. AC network analyser. (June 23rd.)

Bedford.—July 1st. Electricity Department. Trunk road lighting equipment. (June 16th.)

Birmingham. — July 7th. Electric Supply Department. 500-kVA three-phase transformers. (June 23rd.)

Single-phase and three-phase house service type meters. (June 23rd.)

Caithness.—July 21st. Territorial Association. Electrical and heating work of new headquarters at Thurso for the 226th Anti-Aircraft Battery, R.A. (T.A.). Colonel H. F. Baillie, secretary, Caithness County Territorial Association, 57, Church Street, Inverness (deposit £2 2s.).

Cheadle and Gatley.—July 17th. Electricity Department. One 500-kVA oil-cooled transformer. (See this issue.)

Coventry.—July 8th. Electricity Department. One ferro-concrete cooling tower and pond and one brick-built chimney.

Derby.—July 8th. Electricity Department. Electrical control equipment for domestic apparatus. (June 23rd.)

Dumfries.—June 30th. Electricity Department. One four-panel, 3,300-V switchboard. (June 16th.)

Dunfermline.—July 3rd. Town Council. Electric lighting in 204 houses at Brucefield. Town Clerk (deposit £1 1s.).

Edinburgh.—July 1st. Corporation. High-voltage switchgear to specifications Nos. 172 and 173. Town Clerk.

Egypt.—CAIRO.—July 20th. Municipalities Department. Power plant, including Diesel engines and accessories, alternator and exciter, switchgear, pumping sets, travelling crane and tackle and armoured cables, at Minia power station. (T. 23867/1939.)*

July 26th. Electrical apparatus and armoured cables for supply at Sohag. (T. 23866/1939.)*

Exeter.—July 5th. Electricity Department. One battery-driven tower wagon. (June 23rd.)

Farnworth.—July 14th. Electricity Department. Low-voltage cables. (See this issue.)

Fife.—July 7th. County Council. Heating and electrical installation at new police station, North Street, St. Andrews. County Clerk, Cupar (deposit £1 1s.).

July 8th. Heating and electric installations at new clinic at Dunfermline and new infant department, Leslie H. G. School. County Clerk, Cupar (deposit £1 1s.).

Gateshead.—Town Council. Electrical installation at a new nurses' home at High Teams Institution and alterations to the maternity block, &c. Plans by F. H. Patterson, borough engineer, Municipal Buildings.

Greenock.—June 30th. Corporation. Electric lighting in seventy-eight houses. Schedules from director of housing, Municipal Buildings.

Halifax.—July 5th. Electricity Department. One station auxiliary switchboard. (June 16th.)

July 10th. Housing Committee. Electrician's work in fifteen houses and shops at Nursery Lane. P. Saunders, Town Clerk, Town Hall.

Horsham.—July 10th. Electricity Department. Cables. (See this issue.)

Huddersfield. — July 7th. Estate Department. Reconstruction of lift at George Hotel, necessitated by change-over from DC to AC. (June 23rd.)

Ilford.—July 8th. Electricity Department. 6.6-kV metal-clad switchgear. (See this issue.)

India.—SIMLA. — July 18th. Indian Stores Department. Insulating materials, including tapes, micanite sheets, compounds, &c., for twelve months. (T. 23575/39.)*

July 18th. Sub-station equipment at New Delhi railway station. (T. 24145/39.)*

July 13th. Sub-station equipment, together with 300-kVA alternator, low-voltage distribution board, AC motors and starters, cable and wall-type terminal boxes. (T. 23862/1939.)*

July 13th. Electrodes for twelve months. (T. 24073/39.)*

August 3rd. Electric lamps for twelve months. (T. 23576/39.)*

September 5th. Inert and dry cells and sac elements for twelve months. (T. 23861/39.)*

Kettering.—July 12th. Borough Council. Forty-eight street lamps. (See this issue.)

Lanark.—County Council. Electric street lighting installations. (See this issue.)

London. — METROPOLITAN WATER BOARD.—June 30th. Two electrically operated goods lifts. (June 23rd.)

BETHNAL GREEN.—July 7th. Electricity Department. One 500-kVA transformer. (June 23rd.)

ST. PANCRAS.—July 11th. Electricity Department. Cables, meter boards, stoves, fires, washboilers and water heaters for twelve months. June 23rd.)

Longbenton.—U.D.C. Electric lighting installations in 106 houses on the Dudley estate. Plans by H. G. McNaught, surveyor, Council Offices, Forest Hall.

Manchester. — July 3rd. Electricity Committee. 33-kV switchgear, 750-MVA rupturing capacity. (June 16th.)

Middlesbrough.—July 14th. Electricity Department. 660-V and 11,000-V p.i., lead-covered cables for twelve months. 11,000-V circuit-breakers and 250-kVA transformers. (See this issue.)

Newark-on-Trent.—July 24th. Electricity Department. 1,400-yd. of 0.06 sq. in. cable, 11-kV metal-clad ring main unit, 500-kVA transformer and low-voltage sub-station switchboard. (See this issue.)

New Zealand.—WELLINGTON. August 15th. Public Works Department. Two outdoor lightning arrestors and two surge counters. (T. 23311/39.)*

July 13th. Pumps, motors, mountings, piping, valves and control gear for the R.N.Z.A.F. station, Ohakea. (T. 23784/39.)*

August 15th. Time relays and test terminals. (T. 23781/39.)*

August 29th. Contactor panels and push-button boxes. (T. 23782/39.)*

September 12th. 6.6-kV outdoor switchgear and steelwork. (T. 23791/39.)*

September 12th. Seven single-phase transformer banks. (T. 23833/39.)*

September 19th. Two 3,000-kVA, 11-kV, three-phase transformers and control equipment. (T. 23792/39.)*

September 19th. Seven single-phase, double-wound transformer units. (T. 23793/1939.)*

Rhyl.—July 17th. Electricity Department. Extra-high-voltage cable and switchgear and transformers. (June 23rd.)

Salford.—July 11th. Electricity Department. P.i. lead-covered cables for three years. (June 23rd.)

Saltcoats (AYRSHIRE). — June 30th. Town Council. Electrical work at block of seven shops at New England housing estate. Joint Town Clerks (deposit £1 1s.).

Sheffield.—July 31st. Electricity Department. Electrically operated travelling crane at Blackburn Meadows generating station. (See this issue.)

South Africa.—PRETORIA.—July 6th. Union Tender and Supplies Board. One 3-kW, 110-V Diesel engine-driven electric lighting plant complete with generator, switchboard, &c. (T. 23511/39.)*

July 20th. Thirty magneto telephone switchboards. (T. 23513/39.)*

July 20th. Two 100-kVA transformers. (T. 23675/39.)*

August 3rd. Floor pattern magneto switchboards. (T. 23676/39.)*

August 3rd. One 25-cell battery. (T. 23983/39.)*

CAPE TOWN.—July 19th. Electricity Supply Commission. One 380-V switchboard and two transformers. (T. 23952/39.)*

July 26th. Electricity Department. Eight single-phase, double-wound transformer units. (T. 23798/39.)*

Stone.—July 18th. Electricity Department. Extra-high and low-voltage cables at the new Garden Village, Barlaston. (See this issue.)

Uruguay.—MONTEVIDEO. — August 4th. State Electricity Supply and Telephones Administration. Iron insulator bolts or pins. (T.Y. 23467/1939.)*

July 14th. 139,700 metres of lead-covered conductors. (T. 23706/1939.)*

August 3rd. Porcelain insulators and leading-in tubes. (T.Y. 23468/1939.)*

Wolverhampton.—July 7th. West Midlands J.E.A. 33,000-V cable at Willenhall substation. (June 23rd.)

Orders Placed

Aberdeen.—Housing Committee. Recommended. Electrical work in eighty-eight houses, South Middlefield district (£575).—Stroud & Weir.

Exeter.—Housing Committee. Recommended. Electrical installations at twenty-six houses in Rifford Road (£92).—H. W. Wrixton.

Glasgow. — Health Committee. Accepted. Electric cooking range at Bellefield Sanatorium (£131).—Archibald Low Electrics.

Electricity Committee. Accepted for twelve months. Meters. Aron Electricity Meter; Elecl. Apparatus Co.; Measurement; Sangamo Weston; Met.-Vick. Elecl. Co.; English Electric Co.

Transport Committee. Recommended. Cables (£4,826).—Scottish Cables. Gear wheels and magnet coils.—Met.-Vick. Elecl. Co.

Grimsby.—Finance Committee. Recommended. Electric lift at town hall (£843).—Evans Lifts. Electrical installation (£1,346).—J. W. Gladwin & Sons.

Jarrow-on-Tyne. — Education Committee. Accepted. Electrical installation at the Bede Burn Schools (£109).—J. McCabe.

London.—L.C.C.—Accepted. Electrical installations at 898 houses and flats on the Becontree estate (£6,194).—Rylands Elecl. Co. Electrical installation at Beaufort House School (£966).—Jacob White and Co. Wiring and fittings at Oldhill Street School, Hackney (£1,151).—Colston Electrical Co. Electric lighting and power at Ashford residential school (£1,119).—City Electrical Co. Wiring and fittings for electric lighting, supplementary heating and power at Whitefoot Lane School (£784).—Newman and Watson. Wiring and fittings for electric lighting in two blocks of dwellings on the Chicksand Street area, Stepney (£1,370).—Pemberton and Sturgess (Great Britain).

Sunderland.—Town Council. Accepted. Apparatus for the introduction of a system of remote control of electric street lighting.—Standard Telephones & Cables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory, Brunel Road; Continental Laboratories, Ltd.

Addington.—Houses (130), Queen Elizabeth's Drive; First National Housing Trust, Lodge Lane, Addington. Senior school; Croydon Education Committee.

Amble.—Fire station (£423), for the U.D.C.; R. & G. Brown, builders.

Angmering.—Senior school (£17,534); West Sussex Education Committee.

Ashby.—Houses (50), for the Leicestershire Colliery & Pipe Co.

Aspatria.—Houses (57), for the North-Eastern Housing Association; J. Atkinson, builder, Brunswick Road, Penrith.

Backworth (Northumberland).—New R.C. school; R. Burke, architect, Singleton House, Newcastle.

Bebington.—Hotel (£15,800), Spital Cross Roads; A. E. Shennan, architect, 17, North John Street, Liverpool.

Beeston.—New Embassy cinema, The Square, for H. Shapeero, Parliament Street, Nottingham; W. Newman, architect, 24, Johnson Road, Lenton.

Birmingham.—Baptist Church Hall in Beeches Road, Perry Barr. Municipal Bank at Shirley; Dare & Son, builders, Ward End. Three-storey factory in Barford Street; C. Tottle & Son, builders, West Bromwich. Maisonettes (48), at Billesley Lane, Moseley; surveyor, council house. Factory and offices at Elmdon Avenue, Tyburn, for G. H. Hughes & Son; P. W. Cox, Ltd., builders, Grove Lane.

Birtley (Co. Durham).—New R.C. school; R. Burke, architect, Singleton House, Newcastle-on-Tyne.

Border.—Houses at Castlecarrock; R.D.C. surveyor.

Bournemouth.—Hospital, Linford (£89,500); L. F. Richardson, Ltd. Service flats (59), Somerville Road; S. J. Seal & Partners.

Bromborough.—Factory for Hughes & Ellison, Park Lane.

Burradon (Northumberland).—New social club and institute; W. Dixon & Son, architect, 1, Collingwood Street, Newcastle-on-Tyne.

Chester.—Cattle market; City surveyor. Houses (30), Sealand Road; E. R. Gorst. Senior school, Old Wrexham Road; Shrewsbury Djocesan Church Schools Commission. Senior school, Eaton Road; Chester Diocesan Church Schools Association. R.C. Senior School; Edmund Kirby & Sons, architects, Liverpool.

Clutton.—Houses (50), Paulton; R.D.C. surveyor.

Cobridge (STAFFS).—Houses (88), near Waterloo Road; J. E. Homer.

Colchester.—Extensions, East Ward School (£9,389); F. Hutton & Son, Ltd.

Coseley.—Extensions to works, Willfields Road, Ettingshall, for John Thompson Motor Pressings, Ltd.

Coventry.—Chapel, Stoke (£5,000); C. Redgrave, architect, Barbican Chambers, Coventry. Block of shops in Bablake Street; Ernest Batley, builders. Crematorium and other buildings at the Canley New Cemetery; D. E. E. Gibson, architect, 1a, Warwick Row.

Croydon.—Flats (24), Windmill Road redevelopment area, for B.C.; E. Taberner, town clerk, Town Hall.

Dartford.—Houses (134), Darenth Road; P. C. Brazier. Factory, Salisbury Road; E. P. Feakes & Sons. Extensions, Southern Hospital (£59,250); Gee, Walker & Slater, Ltd.

Denbighshire.—Maternity hospital (£59,000), near Wrexham, for C.C.; county architect, Acton Hall, Wrexham.

Dundee.—Houses (800); Scottish Special Housing Association, Ltd., Edinburgh. Additions to Dental Hospital; Maclaren, Soutar & Salmond, architects, 15, South Tay Street. A.R.P. depot for Town Council; Maclaren, Soutar & Salmond, architects, 15, South Tay Street.

Enfield.—R.C. senior school, for U.D.C.; E. Pascal, director of education, Elm House, Gentleman's Row.

Exeter.—Drill hall, Butts Road; Territorial Army Association. Houses (26), Rifford Road (£8,930); F. & E. Small. Church, Rifford Road; Exeter Diocesan Board of Finance.

Fife.—Houses (204), at Brucefield for Dunfermline Town Council; C. R. Douglas & Son, surveyors, 15, East Port, Dunfermline. Games hall, committee room, &c., at Rosyth Dockyard Recreation Club (£3,300); the secretary.

Glasgow.—Extensions, Southern Hospital (£20,000); City engineer. Enlargement, Bellahouston secondary school (£17,000); Education director. Development of Garscadden estate (730 acres), for T.C.; city surveyor. Two churches, Haughburn Road; R.C. & Baptist trustees.

Grimsby.—Hospital (£147,639); W. J. Simms, Sons & Cooke, Ltd.

Hampshire.—School of art and technical instruction, Westgate, Winchester, for C.C.; A. L. Roberts, county architect, The Castle, Winchester.

Harrow.—Fire station headquarters, Pinner Road, for T.C.; borough surveyor.

Hendon.—Two senior schools, Hendon Way site, for E.C.; borough surveyor.

Hinckley.—Sports stadium, &c., Hollycroft Park; U.D.C. surveyor. Additions to factory, Coventry Road, Burbage; Chamberlain & Co. Additions to Dyeworks, Trinity Lane, for Trinity Dyeworks.

Hoole.—Elementary school; Cheshire Education Committee.

Inverness.—Houses (90), Muirtown Nursery site (£33,333), for T.C.; burgh surveyor.

Ipswich.—Extensions to Suffolk District mental hospital, Great Yarmouth Road; E. J. Symcox, architect, County Hall.

Keynsham.—Conversion of premises in Bath Road into public offices; U.D.C. surveyor.

Keswick.—New mill for the Cumberland Pencil Co.; P. M. Hope, architect.

Knowle (Warwickshire).—Large store, site of Swan Inn, Warwick Road, for George J. Mason, Ltd., Birmingham; Ewen Harper, Brother & Co., architects, 101, Corporation Street, Birmingham.

Lanarkshire.—Houses (300-350), Thorn Farm, Bellshill, for C.C.; county architect, Motherwell.

Leatherhead.—Buildings (£40,000), for Leatherhead Cottage Hospital; S. Hall, Easton and Robertson, architects, 54, Bedford Square, London, W.C.1.

Longbenton.—Houses (178), on the Westmoor estate; surveyor, U.D.C. offices, Forest Hall.

Manchester.—Houses (21), French Barn Lane, Blackley, for Wilbraham Building Co., 174a, Church Road, Urmston. Houses (44), Abbey Hey Lane, Gorton; P. C. Kelvey, architect, 379, Moss Lane East. Cinema and car park, Wilmslow Road and Heaton Road, Withington, for A. G. Deacon & Co., 13, St. Ann's Street; Drury & Gomersall, architects, 7, Oxford Road. Houses (106), Victoria Avenue East, Blackley, for Greenwood & Tyson, Victoria estate, Rochdale Road, Blackley, P. C. Kelvey, architects, 379, Moss Lane East.

Mickley (Prudhoe-on-Tyne).—Houses (170), for Prudhoe Urban District Council; W. Dixon & Son, architects, 1, Collingwood Street, Newcastle.

Middlesbrough.—Garage and warehouse, for A. Dowson; W. E. Haslock, architect, 143, Albert Road. New estate (159 houses), near St. Mary's Walk; Dean Brothers, builders, Marton.

Milton (STAFFS).—Houses (20), Norton Street; A. Moss, Ltd.

Morley.—Houses (46), Winterburn estate, Victoria Road; J. S. Bramley & Son. Additions to finishing department, Springfield Mills; Hield Bros., Ltd.

Morpeth.—Extensions to Cottage Hospital.

Northallerton.—Senior school (£32,144); North Riding Education Committee.

Nottingham.—Additions to the General Hospital, including a new ward block and additional accommodation for nurses.

Oakengates.—Extension of iron foundry, for John Maddock & Co.

Ombersley.—Senior school, Oldfield, for Lloyds Charity Governors; Henry Rowe & Son, architects, 38, Foregate Street, Wolverhampton.

Orpington.—Council Offices (£28,000), for U.D.C.; C. E. Kenny and M. Sheffield, architects, 7, Gower Street, London, W.C.1.

Perth.—Royal Infirmary extensions (£15,000).

Petworth.—Junior and senior schools (£35,000); West Sussex Education Committee.

Ploughley.—Houses (30), Stratfield Brake estate; Taylor Woodrow Estates. Houses (14), Woodstock Road; J. A. Pye.

Rugby.—Development of estate, Wesley Road and Greenwood Road, Hillmorton (70 houses); R. Gardner & Sons, Chapel estate.

St. Albans.—Houses (42), Ragged Hill estate; H. C. Janes, Ltd., Hightown Road, Luton.

St. Neots.—New cinema in Market Square; J. Owen Bond & Son, architects, 26, Tombland, Norwich.

Smethwick.—Bank premises, High Street, for Birmingham Municipal Bank; John B. Surman, architect, 19, Cannon Street, Birmingham. Buildings in High Street for Montague Burton, Ltd., Hudson Road, Leeds; N. Martin, staff architect.

Stoke-on-Trent.—Hangars, Aerodrome (£33,899); C. Bryant & Son.

Sunderland.—New premises in High Street West for British Home Stores, Ltd.

Surrey.—Technical College, West Barnes Lane, Raynes Park, for E.C.; Jarvis & Richards, architects, Seddington Street, Sloane Square, London, S.W.1.

Tiverton.—Houses (108), site at Westexe South, for Housing Committee; borough surveyor.

West Hartlepool.—Reconstruction of Lynnfield school for the E.C. (£6,300); borough engineer.

Whickham (Co. Durham).—Houses (120), for U.D.C.; T. Fenbow, Council offices.

Whitley Bay.—New offices for the U.D.C.; Cordingley and McIntyre, architects, The College, Durham.

Wigan.—Extensions (£65,000), Wigan Royal Infirmary; T. Worthington & Sons, architects, 178, Oxford Road, Manchester.

Willesden.—Factory and stores, Stonebridge Park, N.W.10, for Atlas Diesel Co.; S. Peach & Partners, architects, 28, Eccleston Square, London, S.W.1.

Winslow.—Houses (32); R.D.C. surveyor.

Worthing.—Police court and station (£17,447); Kent and Sussex Contractors.

York.—Additions to factory, Aldwork, for W. Wright & Sons, Ltd., Goodramgate; Needham & Sons, architects, 3, Duncombe Place.

TRADE MARK APPLICATIONS

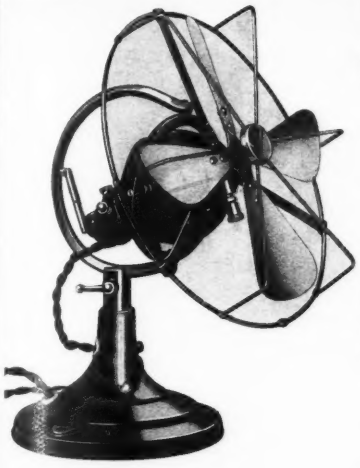
THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 21st.

Kelray. No. 606199. Class 11 (IV). Incandescent electric lamps.—Kelvin Rubber Co., Ltd., 37, Clyde Place, Glasgow.

Maxtrip. No. 606625. Class 11 (IV). Lighting fittings.—British Electric Lamps, Ltd., Spencer Lamp Works, Spencer Hill Road, Wimbledon, S.W.19.

Adelphi. No. 606673. Class 11 (IV). Double filament electric lamps.—B.E.C. (British Electrical Corporation), Ltd., 184, Strand, W.C.2.

FANS



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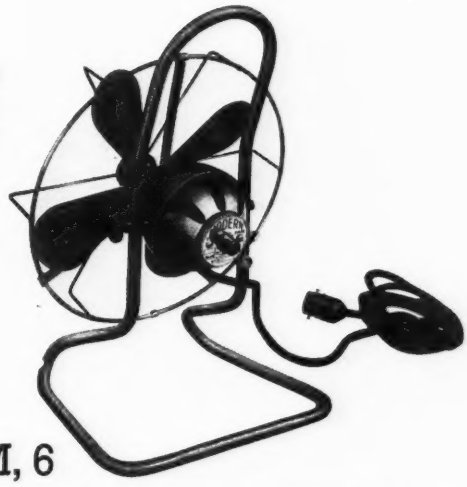
With 8 in. Blades, A.C. or D.C. Consumption 20 watts (approx.). Desk Mounting only.



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The Pioneer of British Blowers!
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FEATURES :—

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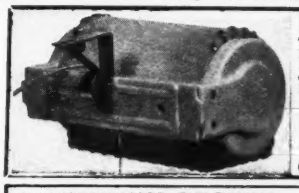
'Phone : Northern 2986/7/8. 'Grams : "Real, Birmingham."

London Depot : 25, Old St., E.C.1. 'Phone : Clerk. 1336/7/8.

Manchester Depot : 15, Byrom St. 'Phone : Black. 8438.



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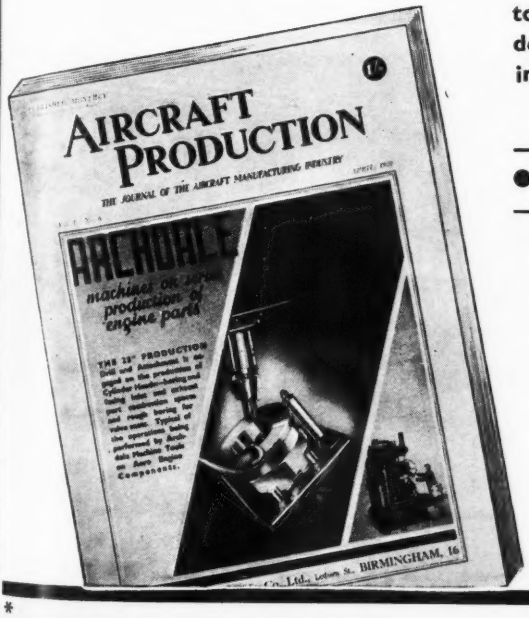
THE JOURNAL OF THE AIRCRAFT MANUFACTURING INDUSTRY



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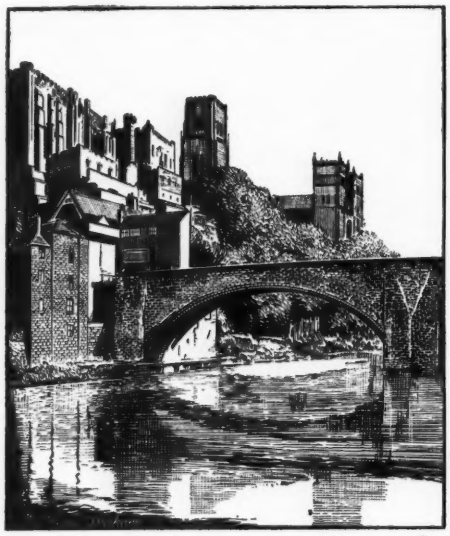
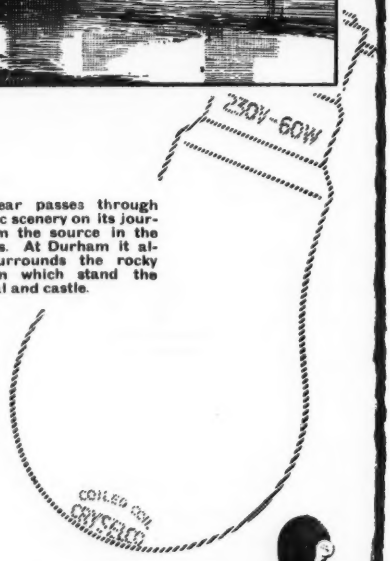
Beautiful Waterways



The Wear passes through romantic scenery on its journey from the source in the Pennines. At Durham it almost surrounds the rocky cliffs on which stand the cathedral and castle.



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CRYSELCO LTD., KEMPSTON WORKS, BEDFORD
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INEXPENSIVE AUTOMATIC TIME CONTROL

TYPE MTSPXC SYNCHRONOUS MOTOR TIME SWITCH

- 10 ampères up to 250 volts S.P. 50 cycles controlled frequency.
- Solar or hand set dial at option.
- Completely automatic.
- Weatherproof box (standard).
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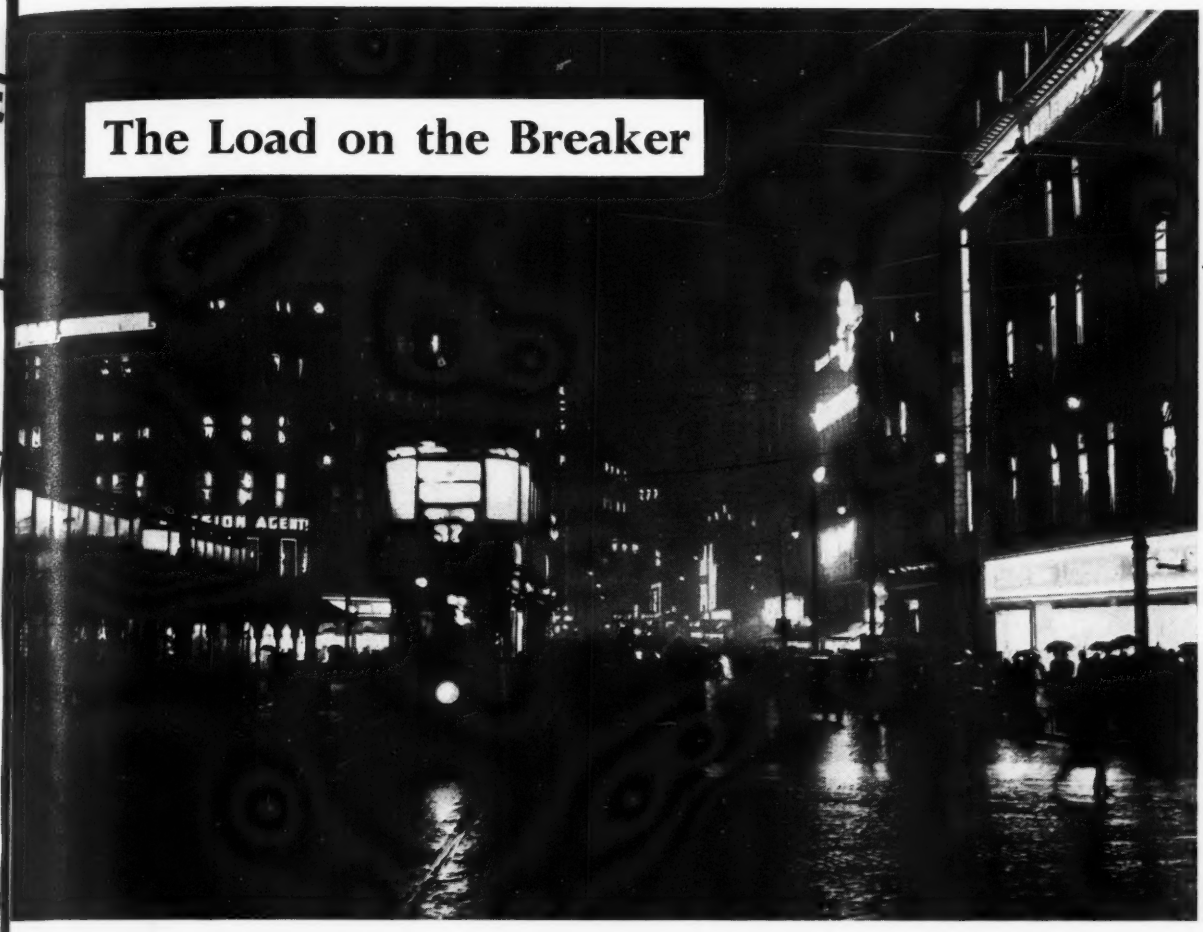

The Load on the Breaker

All's well at the supply station while the load on the circuit-breaker is a fair load — and so long as the switchgear can be relied upon to control safely heavy surges of current made possible under present-day conditions.

Concentrations of load on a scale previously undreamt of have made necessary the establishment of short-circuit testing stations where switchgear can be tested and its precise performance measured and recorded.

The testing stations operated and controlled by the members of A S T A — the Association of Short-Circuit Testing Authorities — provide the vital information necessary to ensure that the switchgear is capable of adequately fulfilling its function.

At the high-power testing stations of A S T A tests are conducted, and certificates of performance issued, in compliance with British Standard Specifications. *Untested* switchgear is of *estimated* performance. *Switchgear carrying the Sealed* A S T A *Certificate of Rating is of known capacity and performance.*

Switchgear tested and certified by

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IGRANIC ELECTRIC MOTOR CONTROL GEAR

Igranic Control Gear is capable of withstanding the most arduous service, and at the same time fully protects expensive machinery and motors, when operated by unskilled workers. The outstanding automatic features embodied in Igranic Control Gear relieve operators of all electrical responsibility, and give positive protection to machines to keep them working to secure maximum production. When you have any motor application to make, no matter how large or small the machine, you can obtain efficient service by using Igranic Control Gear.

Illustration shows Igranic Control Panel for controlling seven 400 h.p. motors for steel mill installation.

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1. *REVO Sodium Lighting in the foundry of W. Slingsby & Co. Ltd., Keighley.*

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REVO Patent "SAFERLITE" Reflectors enable an installation to be kept at its highest efficiency with the minimum of labour. The simple "push-up - pull - down" movement permits reflectors and lamps to be removed or replaced in a moment. No screws or nuts to manipulate. Write for full details.

LIGHTING a busy foundry with its dust, smoke and black sand floor provides, perhaps, one of the most exacting tests of the efficiency of REVO Industrial Lighting Equipment. Here are two typical examples of foundry lighting by means of REVO reflector fittings. The pictures speak for themselves. There is suitable REVO Industrial Lighting Equipment for every conceivable application. Send your enquiries for attention by trained REVO Lighting Engineers.

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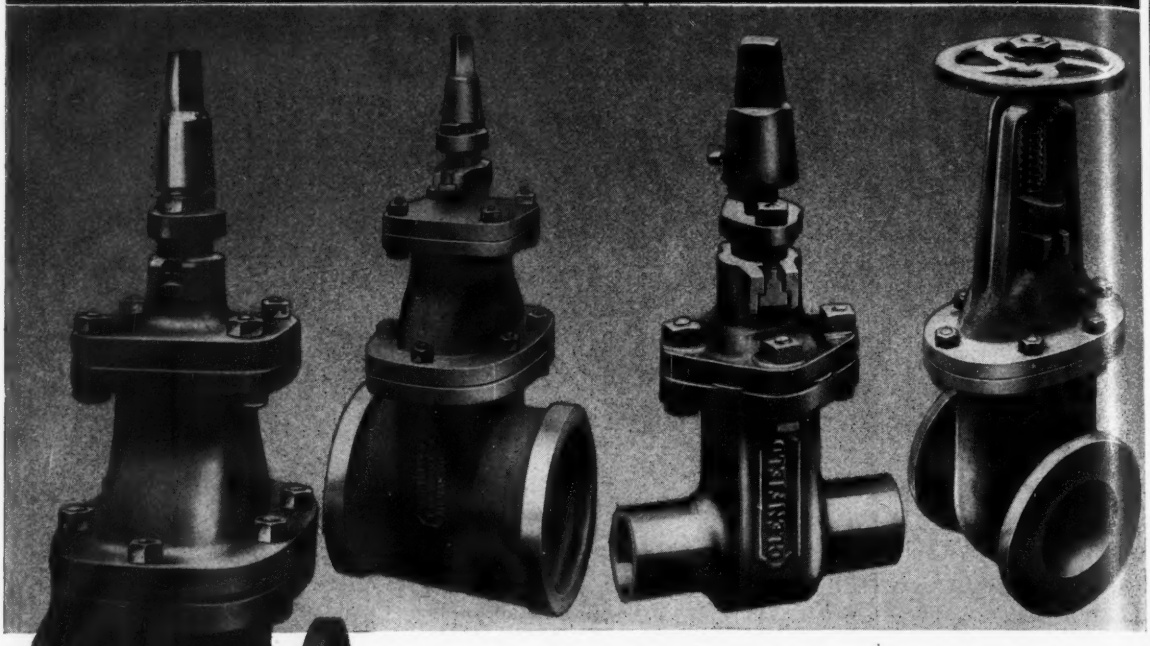
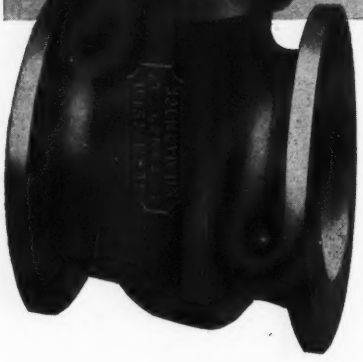
GLENFIELD SLUICE VALVES





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ALTHOUGH the variety of uses for Sluice Valves is almost unlimited, all but the most exceptional requirements can be exactly met from our standard range.

Our standard types comprise valves from 1½" to 48" diameter, which can be supplied with any desired type of connections. End connections can be flanged, socketed, provided with flange and bellmouth, made suitable for Victaulic joints, for Asbestos-Cement pipes, or to any special requirements. Flanged valves can be provided with spigot and socket pieces, double flanged distance pieces, slip joints, etc. Socketed valves can be made suitable for Cast Iron, Mild Steel or Concrete Pipes.

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HYDRAULIC ENGINEERS TO THE EMPIRE

ONE OF THE J.&P. PAGES

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Automatic control, for the elimination of manual control, was essential under the special conditions of supply, for full advantage to be obtained from the power factor improvement scheme designed and manufactured by us for the works of Messrs. E. & E. Kaye, Ltd., Ponders End.

Three 50 kVAr J. & P. Condensers are controlled by a reactive kVA relay of the five step type—two ways for future condensers to meet expected load increase. The actual switching is by means of three 150 amp. triple pole contactors protected by high rupturing capacity fuses and a completely interlocked isolator.

Briefly, this description indicates that J. & P. are equipped to carry out power factor improvement schemes in the most difficult conditions. Actually, this is almost a complete J. & P. contract, Cables, Switchgear, Transformers and Condensers. If you are not certain that you are enjoying the best terms for electric power, we will gladly send an engineer to you to discuss power factor.

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The mark that means that "little more" in quality

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LANDOR Single Cord CEILING SWITCH

with 2 Outstanding Features

1 **Roller chain for strength and flexibility**

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TYPES: Surface or Semi-Recessed.
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ELECTRICAL REVIEW

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **5.30 p.m. on Tuesday**, at Dorset House, Stamford Street, London, S.E.1.

THE CHARGE for advertisements in this section is 1/9 per line per insertion, or for display advertisements 14/- per inch, with a minimum of one inch.

FOR SITUATIONS VACANT AND WANTED there is a special reduced rate of 1d. per word if prepaid, minimum 1/-. A Box Number, when required, is charged as six words, and there is also in this case an additional charge of 6d. for postage of replies. Three insertions under these headings can be obtained for the price of two if ordered and prepaid with the first insertion. If placed to account the charge for each insertion is 2/6 for three lines and 9d. for each additional line.

REPLIES TO advertisements published under a Box Number if not to be delivered to any particular firm or individual should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Letters of applicants in such cases cannot be returned to them. The name of an advertiser using a Box Number will not be disclosed. All replies to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1

Original testimonials should not be sent with applications for employment.

OFFICIAL NOTICES—TENDERS ETC

BOROUGH OF ILFORD.

Electricity Department.

SUPPLY OF 6.6 kV METAL CLAD SWITCHGEAR.

TENDERS are invited for the supply and delivery to Monk Road Sub-station of the above.

Specification and form of tender may be obtained on application to Mr. G. F. Gregory, M.I.E.E., A.M.I.Mech.E., Borough Electrical Engineer and Manager, Central Electricity Offices, 320-326, High Road, Ilford.

Tenders in plain sealed envelopes endorsed "TENDERS FOR METAL CLAD SWITCHGEAR" must be delivered by 12 noon on Saturday, July 8th, 1939, and the envelope must not bear any name or mark indicating the sender. Tenders which do not comply with this requirement will not be received.

The Council does not bind itself to accept the lowest or any tender.

By order,
CHARLES N. ROBERTS,
Town Clerk.

Town Hall,
Ilford.
20th June, 1939. 723

BOROUGH OF KETTERING.

Road Lighting Installation.

THE Council of the Borough of Kettering invite tenders for the supply and erection of forty-eight public street lamps with extended telescopic arms for central suspension in connection with the lighting of a section of the trunk road A.6 within the boundaries of the Borough.

Copies of the specification may be obtained on application to the Borough Surveyor, 3, Gold Street, Kettering.

The Contractor, whose tender is accepted, will be required to enter into a contract under seal in accordance with the Corporation's standing orders.

The tender must be submitted in a plain sealed envelope supplied by the Corporation endorsed "Tender for Street Lighting," and must be received by me not later than the 12th day of July, 1939.

The Council do not bind themselves to accept the lowest or any tender.

JOHN CHASTON,
Town Clerk.

Town Clerk's Office,
Kettering. 738

STATE ELECTRICITY COMMISSION OF VICTORIA.

22-32, William Street, Melbourne, Australia.

TENDERS are invited for the manufacture, supply and delivery, in accordance with Specification No. 39-40/2, of Alternating Current Network Analyser.

Copies of the Specification are available at the office of the Agent-General for Victoria, Melbourne Place, The Strand, London, W.C.2, subject to a charge of £1 1s. (returnable under certain conditions as specified) for 3 copies and 10s. 6d. (not returnable) for each extra. Tenders endorsed "Spec. No. 39-40/2," together with a preliminary deposit of £10, are returnable at the Commission's Office, Melbourne, by 11 a.m. on Tuesday, 3rd October, 1939.

The Commission does not bind itself to accept the lowest or any tender.

W. J. PRICE,
Secretary.
694

SHEFFIELD CORPORATION ELECTRICITY DEPARTMENT.

Electrically Operated Overhead Travelling Crane.

THE Electricity Committee are prepared to receive Tenders as called for under Specification No. B.M.130 for a :—

Thirty Ton maximum capacity Electrically Operated Travelling Crane at the Blackburn Meadows Generating Station.

Contractors desiring to submit Tenders may obtain Specification and Form of Tender at this Office on and after Saturday, 1st July, 1939, on making a deposit of £2 2s., which sum will be refunded on receipt of a bona fide Tender.

To meet the convenience of Contractors, two copies of the Specification will be furnished; additional copies may be purchased at a cost of £1 1s. per copy.

Any person or firm sending in a Tender will be required to comply with the Standing Orders of the Council and to the standard rates of wages, and proper hours and conditions of labour.

A print of the Standing Orders may be obtained from the Department.

Tenders to be forwarded to the Town Clerk, Town Hall, Sheffield, 1, enclosed in the official envelope provided which must be sealed and bear no name or mark indicating the sender, and received by him not later than the first post on Monday, 31st July, 1939.

Tenders received after the time stipulated herein will not be considered.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN R. STRUTHERS,
General Manager and Engineer.

Commercial Street,
Sheffield, 1.
June, 1939. 737

HORSHAM URBAN DISTRICT COUNCIL.

Electricity Department.

CABLES.

THE above named Council are prepared to consider Tenders from British manufacturers, not factors, for :—

2,103 yards (approx.) of E.H.T. three-core paper insulated, single wire armoured Cable, suitable for 11,000 volts working pressure, with centre point earthed. Manufactured in accordance with the British Engineering Standards Specification.

1,095 yards (approx.) of L.T. five-core paper insulated, lead sheathed, steel tape armoured Cable, suitable for a working pressure up to 660 volts, having shaped conductors, to British Engineering Standards 7/1926.

The makers will also be required to tender for the laying of the cable, and complete jointing of same.

Full particulars and specification may be obtained, on deposit of one guinea (returnable to bona fide tenderers), from the undersigned.

Additional copies 2s. 6d. each, not returnable.

Sealed tenders, endorsed on the outside "E.H.T. and L.T. Cable," must be delivered to the undersigned not later than noon on Monday, July 10th, 1939.

The Council do not bind themselves to accept the lowest or any tender.

A. SLYFIELD,
Clerk to the Council.

Council Offices,
Horsham Park,
Horsham.
19th June, 1939. 740

OFFICIAL NOTICES.—TENDERS, ETC.—*Contd.*

COUNTY BOROUGH OF MIDDLESBROUGH.

Electricity Department.

PAPER INSULATED CABLES—ANNUAL CONTRACT.

THE Corporation invite Tenders for the twelve months' supply of 660 Volts, Paper Insulated, Lead Covered Double Hessian Taped CABLES and 11,000 Volts, Paper Insulated, Lead Covered Double Hessian Taped Single Wire Armoured CABLE for the Electricity Department.

Tender forms and specifications can be obtained on written application to the undersigned, to whom tenders must be delivered in plain sealed envelopes, endorsed "Tender for Electric Cable," and not bearing any name or mark indicating the sender, not later than 9 a.m. on Friday, 14th July, 1939.

The Corporation do not bind themselves to accept the lowest or any tender.

PRESTON KITCHEN,
Town Clerk.

Municipal Buildings,
Middlesbrough.
26th June, 1939. 742

COUNTY OF LANARK.

Tenders for Electrical Street Lighting Installations.

THE County Council of the County of Lanark will shortly be in a position to issue Schedules for the work of erection of electrical street lighting installations in various parts of the County.

Electrical installation contractors (whose names must appear on the National Register of Electrical Installation Contractors) who are desirous of tendering for the works, are requested to communicate immediately with Mr. Thomas M. Stephen, County Drainage and Lighting Engineer, 23, Clydesdale Street, Hamilton, in order that their names may be placed on the list of Contractors to whom Specifications and Schedules of Quantities may be issued.

The County Council reserve to themselves the right in issuing Specifications and Schedules of Quantities to make a selection from the list of contractors who send in their names.

WALTER HENDERSON,
County Clerk.

Lanarkshire House,
191, Ingram Street,
Glasgow.
June, 1939. 739

COUNTY BOROUGH OF MIDDLESBROUGH.

Electricity Department.

TENDERS are invited for the supply and delivery of 11,000 volts Circuit Breakers.

Specifications may be obtained from the undersigned to whom tenders must be delivered in plain sealed envelopes, endorsed "Circuit Breakers," and not bearing any name or mark indicating the sender, not later than 9 a.m. on Friday, 14th July, 1939.

The Corporation do not bind themselves to accept the lowest or any tender.

PRESTON KITCHEN,
Town Clerk.

Municipal Buildings,
Middlesbrough.
26th June, 1939. 743

COUNTY BOROUGH OF MIDDLESBROUGH.

Electricity Department.

TENDERS are invited for the supply and delivery of 250 kVA Transformers.

Specifications may be obtained from the undersigned, to whom tenders must be delivered in plain sealed envelopes, endorsed "Transformers," and not bearing any name or mark indicating the sender, not later than 9 a.m. on Friday, 14th July, 1939.

The Corporation do not bind themselves to accept the lowest or any tender.

PRESTON KITCHEN,
Town Clerk.

Municipal Buildings,
Middlesbrough.
26th June, 1939. 744

OFFICIAL NOTICES.—TENDERS, ETC.—*Contd.*

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL.

Electricity Department.

CONTRACT NO. 113.

THE Council invite Tenders from British manufacturers for the supply, delivery and erection of the following:—

ONE 500 kVA OIL COOLED TRANSFORMER WITH MANUALLY OPERATED "OFF-LOAD" TAP CHANGER.

Forms of Tender, General Conditions and Specifications can be obtained from Mr. R. W. Willis, M.I.E.E., Engineer and Manager, 37, High Street, Cheadle, Cheshire, on payment of one guinea, which amount will be refunded on receipt of a bona-fide Tender.

Duplicate copies of the Specification, etc., can be obtained on payment of 10s. 6d., which sum is not returnable.

Tenders must be enclosed in plain sealed envelopes endorsed with the Contract number, but not bearing any name or mark indicating the sender, and shall be delivered to the undersigned not later than 10 a.m. on Monday, July 17th, 1939.

The firm or firms whose Tender may be accepted will have to complete and fulfil the Council's usual Contract.

The Council do not bind themselves to accept the lowest or any Tender.

W. TIMPERLEY,
Clerk to the Council.

Council Offices,
High Street,
Cheadle, Cheshire.
24th June, 1939. 741

FARNWORTH URBAN DISTRICT COUNCIL.

Electricity Department.

THE Council invite tenders for:—

E.D.156.—LOW TENSION CABLES.

Specifications may be obtained upon application to A. J. HUTCHINSON, Electrical Engineer and Manager, Electricity Works, Albert Road, Farnworth, Lancs. No tender will be received except in a PLAIN SEALED ENVELOPE bearing the words "TENDER—E.D.156—LOW TENSION CABLES."

The Council do not bind themselves to accept the lowest or any tender.

Tenders must be addressed to the Clerk to the Council, Town Hall, Farnworth, Lancs, and delivered not later than Friday, July 14th, 1939.

(Signed) F. ENTWISTLE,
Clerk.

Town Hall,
Farnworth,
Lancs.
June, 1939. 763

BOROUGH OF NEWARK-ON-TRENT.

Electricity Department.

TENDERS are invited for supply and delivery of:—

(a) 1,400 yards 0.06 sq. in., E.H.T., 3-core, P.I.L.C., D.S.T.A. Cable.
(b) 11 kV Metal Clad Ring Main Unit.
(c) 500 kVA, 11,000/400/230 Transformer.
(d) L.T. Sub-station Switchboard.

Copies of Specification and Forms of Tender may be obtained on application to the Borough Electrical Engineer, 2, Market Place, Newark-on-Trent.

Tenders, in plain envelopes, sealed and endorsed, must reach the undersigned not later than 12 o'clock noon on Monday, July 24th, 1939.

The lowest or any Tender will not necessarily be accepted.

H. TALLENTS,
Town Clerk.

Town Clerk's Office,
Newark-on-Trent.
June 26th, 1939. 751

OFFICIAL NOTICES.—TENDERS, ETC.—*Contd.*

STONE URBAN DISTRICT COUNCIL.

Electricity Department.

TENDERS are invited for the laying and jointing of E.H.T. and L.T. Cables at the new Garden Village, Barlaston, Stone, Staffs.

The work comprises approximately 1,350 yards of 11 kV and 1,800 yards of 400/230-volt Cables.

Tenders for this work must be received by the undersigned not later than the first post July 18th, 1939, in plain sealed envelopes marked "Garden Village."

Specifications can be obtained from the Engineer, Stone Urban District Council, Electricity Department, Stone, Staffs.

C. H. MATTHEWS,
Clerk to the Council.

Town Hall,
Stone, Staffs.
June 26th, 1939. 762

SITUATIONS VACANT.

AIR MINISTRY.

A NUMBER of vacancies exist for Technical Officers and Assistants II and III at various Royal Air Force Stations for work in connection with the development installation and maintenance of wireless equipment.

The qualifications required are :—

(*a*) Education to degree standard or equivalent in Physics or electrical engineering, or a sound technical training.

(*b*) Workshop or laboratory experience in the development of radio communication equipment.

A knowledge of the operation and maintenance of Royal Air Force wireless equipment would be an advantage.

Salary Scales are :

B.210. Technical Officers—£275×£18—£455×£25—£580 (men). £275×£12—£347×£18—£464 (×£25—£580 in exceptional cases) (women).

B.211. Assistants II —£315×£12—£385 (men). £265×£12—£315 (women).

B.212. Assistants III —£130×£12—£214 (efficiency bar) ×£12—£310 (men). £130×£12—£214 (efficiency bar) ×£12—£260 (women).

The appointments will be non-pensionable in the first instance.

Requests for the necessary form of application should be addressed to the Under Secretary of State, Air Ministry, (S.2.A/B.8019), Berkeley Square House, Berkeley Square, W.1, quoting the appropriate reference number and enclosing a stamped addressed envelope. 590

CROWN AGENTS FOR THE COLONIES.

Colonial Government Appointments.

APPLICATIONS from qualified candidates are invited for the following posts :—

M/8600 ELECTRICAL MECHANICIAN required by the Governments of Kenya, Uganda and Tanganyika for the Joint Postal Service for one year in the first instance, with possibility of permanent appointment to the Local Civil Service. Salary £360-£20-£540 a year. Free passages with liberal leave on full salary. Candidates, under 35, must be trained instrument makers; have had general workshop experience with the British Post Office or a reputable electrical firm; experience in the reconditioning of all kinds of telephone and telegraph apparatus, including Wheatstone and Teleprinter; and be capable of undertaking the control of Asian and African staff. Preference will be given to candidates who have a knowledge of the maintenance of motor vehicles and of carpentry.

M/8602. TELEGRAPH INSPECTOR required by the Government of the Gold Coast, Posts and Telegraphs Department, for two tours each of 12-24 months, with possible permanency. Salary £400-£12-£500 a year. Outfit allowance £25. Free quarters and passages and liberal leave on full salary. Candidates, aged 25-35, must possess sound theoretical knowledge and have had at least three years' practical experience of Post Office service of manual magneto and central battery telephone exchanges; telegraph circuits, simplex, duplex and quadruplex; overhead and underground line construction and maintenance, and preferably a working knowledge of teleprinter apparatus.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting the reference number against the appointment for which application is made. 769

SITUATIONS VACANT.—*Continued.*

COIMISIUN NA STAT-SHEIRBHISE.

Positions Vacant: Assistant Engineers (5), Department of Posts and Telegraphs.

APPLICATION forms for and full particulars of five vacancies in the Department of Posts and Telegraphs for Assistant Engineers may be obtained free from the Secretary, Civil Service Commission, 45, Upper O'Connell Street, Dublin.

Age Limits : 21 to 35 years.

Salary : *Men* : £150-£15-£350 a year, plus bonus.
Women : £150-£10-£250 a year, plus bonus.

A successful candidate with approved practical experience may be allowed to enter the appropriate salary scale at a point above the minimum.

Each candidate must (i) hold a recognised University Degree in Engineering and have taken an Electrical Engineering subject in the Final Examination for such Degree, *or*

(ii) Hold a recognised University Degree in Science and have taken Experimental Physics as a subject in the Final Examination for such Degree, *or*

(iii) Have passed in Parts I and II of the Graduateship Examination of the Institution of Electrical Engineers, *or*

(iv) Produce evidence that he/she has passed in an examination (or group of examinations) of a standard equivalent to that of Parts I and II of the Graduateship Examination of the Institution of Electrical Engineers.

Each candidate must also have a good knowledge of Mathematics.

Latest date for receiving completed application forms : 4th July, 1939. 721

W. H. Co., 18/C3718.

AIR MINISTRY.

Civilian Instructors Required.

VACANCIES EXIST for CIVILIAN FITTER, METAL AIRCRAFT RIGGER, CARPENTER RIGGER INSTRUCTORS, at an initial rate of pay of £4 a week inclusive, increasing to £4 5s. on the satisfactory completion of a probationary period of one month, and thereafter by annual increments of 2s. 6d. a week to £4 12s. 6d. a week.

The NECESSARY QUALIFICATIONS are :

Fitter instructors must be capable of lecturing and of demonstrating the theory of the internal combustion engine and of undertaking instruction in dismantling and erecting engines. Aero engine experience and use of precision tools are essential.

Metal aircraft rigger instructors must be capable of lecturing and of demonstrating the working of light metal tubes and plates as used in airframe construction. Knowledge of the rigging of airframes is required.

Carpenter rigger instructors must be capable of lecturing and demonstrating the repair of wooden airframes. Knowledge of the rigging of airframes is necessary.

Applications should be addressed to the Air Officer Commanding No. 24 (Training) Group, Royal Air Force, Halton, Aylesbury, Bucks, giving particulars as to previous experience, age, etc. Suitable applicants will then be required to attend at the nearest Royal Air Force trade testing centre for the necessary trade test and medical examination. 30

CITY OF PORT ELIZABETH, SOUTH AFRICA.

Municipal Notice No. 168 of 1939.

ELECTRICITY DEPARTMENT—ASSISTANT MAINS ENGINEER.

APPLICATIONS are invited for the abovementioned position in the City Electrical Engineer's Office, Port Elizabeth, South Africa. The appointment will be in grade 15 of the Council's Grading Scheme, salary scale £360-£20-£460.

The appointment will be subject to the conditions of service and leave regulations of the Council, and the successful applicant will be required to become a member of the Municipal Pension Fund.

Further particulars may be obtained from Messrs. Davis & Soper, Ltd., 54, St. Mary Axe, London, E.C.3.

Applications for the appointment to reach Messrs. Davis & Soper, Ltd., not later than 12 noon on Saturday, 15th July, 1939.

Dated at Port Elizabeth this 15th day of June, 1939.

By Order,
G. H. BREWER,
Acting Town Clerk.
774

SITUATIONS VACANT.—*Continued.*

BOROUGH OF HESTON AND ISLEWORTH.

Electricity Department.

SHIFT CHARGE ENGINEER.

APPLICATIONS are invited for the position of Shift Charge Engineer.

Applicants must have a sound theoretical knowledge and considerable practical experience in the operation, running and maintenance of water tube boilers, reciprocating and turbine type D.C. generating plant, E.H.T. and L.T. Switchgear, motor converters, rotary converters, rectifiers, 3-wire D.C. Balancers, large secondary batteries, booster charging equipment, etc.

Applicants must be capable of carrying out running repairs, tests and overhauls to all station plant.

The salary will be in accordance with Grade 8, Class D, of the National Joint Board Schedule. The commencing salary will be £294 18s., plus 5 per cent. per annum.

The appointment is subject to the Local Government Superannuation Act, 1937, and the successful candidate will be required to undergo a medical examination.

The person appointed will be required to carry out such duties as may be assigned to him, to devote his whole time to the duties of his office, and to reside within the Borough.

Form of Application may be obtained from Mr. S. H. Fowles, M.I.E.E., M.I.Mech.E., M.Inst.B.E., Borough Electrical Engineer and Manager, Electricity Offices, 11, Staines Road, Hounslow, Middlesex, and must be forwarded together with copies of not more than three recent testimonials enclosed in a plain sealed envelope endorsed "Charge Engineer," to me at the Council House, not later than 12 noon on Thursday, the 13th July, 1939.

Canvassing any member or officers of the Council, either directly or indirectly, will be deemed a disqualification.

HAROLD SWANN,
Town Clerk.

Council House,
Hounslow. 791

BOROUGH OF ALDERSHOT.

Electricity Department.

METER TESTER.

APPLICATIONS are invited from fully qualified Meter Testers for the above appointment.

The rate of pay will be in accordance with the N.J.I.C. No. 11, South Coast Area. Present rate of pay 1s. 8.04d. per hour, 47-hour week.

Applicants must have had practical experience in the testing and calibrating of A.C. Single Phase, Prepayment Fixed Charge Collectors, and D.C. Meters. They must also be conversant with the Electricity Commissioners' requirements and the instruments connected with a Class A Testing Station under the Electricity Supply (Meters) Act, 1936.

The post will be subject to the provisions of the Local Government and Other Officers Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, stating age, and giving full details of training, and practical experience, together with copies of three recent testimonials, to be delivered not later than Friday, 7th July, 1939, to the undersigned.

L. W. GEORGE,
Borough Electrical Engineer.

Showrooms and Offices,
87, Victoria Road,
Aldershot.
27th June, 1939. 787

MID-LINCOLNSHIRE ELECTRIC SUPPLY CO., LTD.

Sales Assistant.

APPLICATIONS are invited for the position of Sales Assistant in one of the Company's District Offices. Candidates, who should be about 30 years of age, must have had previous experience in the Sales Dept. of an Electricity Supply Undertaking.

The appointment, which carries the advantages of a Pension Scheme, involves the general supervision of the Sales Work in the District.

Applications, stating salary required, together with particulars of training and experience and copies of recent testimonials, should be sent to the Resident Manager, North House, Grantham, not later than July 10th. 766

SITUATIONS VACANT.—*Continued.*

WAR DEPARTMENT (AND LATER FOR MINISTRY OF SUPPLY WHEN FORMED).

Staff for Scientific Research.

APPLICATIONS invited from adult male candidates for the undermentioned appointments. Successful candidates will be posted in the first instance to the Bawdsey Research Station, Woodbridge, Suffolk, and will be required to undertake or assist in research and experimental work in connection with one of the following: design of apparatus for radio direction finding, design of apparatus for radio and/or line communications, design of electro-acoustic apparatus.

SCIENTIFIC OFFICER.—Candidates must hold a first or second class Honours degree in Physics, Mathematics or Electrical Engineering, and have had considerable experience in research or experimental work, either at a University or with a commercial firm.

ASSISTANT II.—Candidates must possess a sound knowledge of the theory of radio communication and should preferably have had training to the standard of a University degree in Physics or Electrical Engineering and be capable of undertaking experimental and design work in radio communication problems.

ASSISTANT III.—Candidates should preferably be under 30 years of age and have had laboratory or works experience in radio engineering and training up to the standard of a University degree in Physics or Electrical Engineering.

ANNUAL SALARY SCALES, ETC.

SCIENTIFIC OFFICER.—£400 by £18 to £454, and thence by £25 to £680 (efficiency bar at £580).

Exceptionally, a commencing salary up to £454 will be given to selected candidates with special qualifications and experience in research or experimental work. The Federated Superannuation System for Universities will apply to this appointment. The Government contributes approximately 10 per cent. of salary and the individual approximately 5 per cent. of salary.

ASSISTANT II.—£315 by £12 to £385.

ASSISTANT III.—£130 by £12 to £310 (efficiency bar at £214). Higher commencing salaries up to £214 may be approved according to qualifications and experience, and in this connection the possession of a University degree will be taken into consideration.

Increments are annual and subject to satisfactory service.

Promotion to higher grades, and in the case of Assistant grades appointment to pensionable posts, is governed by suitability and merit as and when vacancies arise .

Ex-members of H.M. Forces given preference, other things being equal.

Application forms obtainable by post-card from the Under Secretary of State (C.5), The War Office, London, S.W.1, and to be lodged not later than 10th July, 1939. Quote Appts. 154 (F). 767

AIR MINISTRY.

Directorate of Works.

APPLICATIONS are invited for temporary appointments as Mechanical and Electrical Drawing Office Assistants at the Air Ministry Headquarters and at R.A.F. aerodromes in the provinces at a salary up to £420 per annum according to qualifications and experience.

Only applicants with first-class training and experience, aged 30 to 45 years, will be considered.

Candidates must be capable of design work and preparing finished drawings of complete electrical power and lighting schemes for aerodromes, internal equipment of domestic buildings, workshops, aeroplane sheds. Preference will be given to candidates with mechanical engineering experience of power plants, water supply and sewage disposal works.

Requests for forms of application should be addressed to The Under-Secretary of State, Air Ministry (W.9), Adastral House, Kingsway, London, W.C.2, *enclosing an addressed unstamped envelope.* 96

CROWN AGENTS FOR THE COLONIES.

Colonial Government Appointments.

APPLICATIONS from qualified candidates are invited for the following post:—

CABLE JOINTER required by the Government of Nigeria for the Electrical Branch of the Public Works Department for two tours each of 12-24 months, with possible permanency. Salary £400-£12-£560 a year. Outfit allowance £25. Free passages, quarters and liberal leave on full salary. Candidates, age 25-30, must have had a sound experience of high and low tension jointing of paper insulated cables. Preference will be given to candidates who have had experience with the erection of overhead low tension electric lines.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/8606. 794

SITUATIONS VACANT.—*Continued.*

COUNTY BOROUGH OF SWANSEA.

Electricity Department.

CHIEF TECHNICAL ASSISTANT.

APPLICATIONS are invited for the above position at a present salary of £682 7s., rising to £727 6s. per annum in accordance with Grade 2, Class H of the N.J.B. Schedule.

Initially the duties will be those of "Clerk of Works," while alterations to existing Boilers and Turbo Generators and the installation of one new 37,500-kVA Brush Set and two new 230,000-lb. Boilers are proceeding.

Applicants must be fully trained engineers, under 40 years of age, who have been actually engaged upon the installation, commissioning and operation of large units in a station of not less than 100,000-kW capacity, and using pulverised fuel.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination.

Forms of application can be obtained from the Borough Electrical Engineer and Manager, Guildhall, Swansea, to whom they must be delivered not later than Saturday, 22nd July, 1939.

Canvassing in any form will be a disqualification.

H. L. LANG-COATH,
Town Clerk.

Guildhall,
Swansea.
27/6/39. 788

METROPOLITAN BOROUGH OF HACKNEY.

Appointment of Boiler House Engineer, Electricity Department.

APPLICATIONS are invited for the above position at a salary in accordance with Grade 8A of the National Joint Board Schedule of Salaries, viz., £364 17s. 6d., rising to £385 19s. 7d. per annum.

Applicants must have had a sound mechanical workshop training with experience in the efficient operation of high-pressure water tube boiler plant and auxiliaries. A good knowledge of combustion as applied to large modern boilers is essential.

The appointment will be subject to one month's notice on either side and to the provisions of the Council's Superannuation Acts. The selected candidate will be required to pass a medical examination.

Conditions of appointment, together with form of application, can be obtained from the undersigned upon receipt of a stamped addressed foolscap envelope.

Applications, endorsed "Boiler House Engineer," must reach the undersigned not later than 9 a.m. on Tuesday, 11th July, 1939.

Canvassing, either directly or indirectly, is prohibited, and will be deemed a disqualification.

R. H. R. TEE,
Town Clerk.

Town Hall, Hackney, E.8.
26th June, 1939. 773

CITY AND ROYAL BURGH OF DUNDEE.

Electricity Department.

ASSISTANT ENGINEER FOR METER TEST ROOM.

APPLICANTS for the above position must have had proper technical training and practical experience in the calibration and adjustment of H.T. and L.T. supply meters, indicating and recording instruments, system protective relays, and must assist generally the Meter Superintendent with instrument and other testing work. A knowledge of chemical testing would be an advantage.

Commencing salary in accordance with N.J.B. Schedule, Grade 9A, Class "G," at present £247 4s. per annum.

The post will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.

Applications, stating age and full particulars of technical training and practical experience, with copies of recent testimonials, must be delivered to the undersigned not later than Tuesday, July 11th, 1939.

D. H. BISHOP, B.Sc., M.I.E.E.,
General Manager and Engineer.

Electricity Supply Department,
Dudhope Crescent Road,
Dundee.
26th June, 1939. 768

SITUATIONS VACANT.—*Continued.*

BOROUGH OF EALING.

Electricity Department.

APPLICATIONS are invited for the position of MAINS ASSISTANT from candidates who have had a sound technical education and practical experience in H.T. and L.T. Distribution work. Drawing office experience, mains record office experience, or an ability for survey sketching will be considered important assets.

The salary will be in accordance with N.J.B. Schedule, Class F, Grade 10 (present commencing salary £224 16s. 1d. per annum).

The appointment will be subject to the provisions of the Local Government and Other Officers Superannuation Act, 1922, a successful medical examination and 12 months' probationary service.

Applications, giving age, details of education, training, positions held, present position and salary, and notice required, together with copies of not more than three recent testimonials, should be sent to me not later than noon on Monday, July 10th, 1939.

RONALD BIRT,
Borough Electrical Engineer and Manager.

Electricity House,
Ealing, W.5. 783

LONDON COUNTY COUNCIL.

REQUIRED in September at South East London Technical Institute, S.E.4, Visiting Teachers for:—

Engineering Science SI ...	Tues.	7.0-9.30 p.m.	16s.
Mathematics SI	Mon.	7.0-9.30 p.m.	16s.
Instrument workshop practice SI	Wed.	4.45-6.45 p.m.	16s.
Instrument workshop practice	Mon.	4.45-6.45 p.m.	16s
Instrument workshop practice	Tues.	7.0-9.30 p.m.	16s.
Heat Engines A2	Wed.	7.0-9.30 p.m.	22s.

Fees quoted (for each attendance) include payment for any duties outside teaching period. Forms from Education Officer (T.I.), County Hall, S.E.1 (stamped addressed foolscap envelope) to be returned by 17th July. Canvassing disqualifies. 797

A DRAUGHTSMAN is required for cable layout work during extensions to the power station of a large undertaking in the North. Candidates must have received a thorough technical training, be accustomed to fixing cable layouts in a power station from drawings, and preparing schedules of quantities for materials. Applicant must state age, technical training, experience and salary expected.—Apply Box 667, c/o The Electrical Review.

A GOOD opportunity arises in Lancashire for a Designer Draughtsman with experience in small circuit breakers. Permanent position. State age, experience and salary.—Box 731, c/o The Electrical Review.

APPLICATIONS are invited for the position of a Junior Mains Assistant Engineer from persons possessing initiative and the necessary technical qualifications and practical experience of E.H.V. and L.V. distribution systems, erection and maintenance. A knowledge of estimating will be an advantage. The commencing salary will be in accordance with the National Joint Board Schedule, 8b, Class G, £305 8s. per annum. The post will be subject to the provisions of the Local Government Superannuation Act, 1937, and the selected candidate will be required to pass a medical examination.—Applications, stating age, married or single, technical experience and qualifications and accompanied by copies of recent testimonials, to be sent to Box 668, c/o The Electrical Review.

APPLICATIONS for a Junior Assistant Mains Engineer are required by a large undertaking from persons possessing the necessary qualifications and capable of superintending the installation and maintenance of E.H.T. and L.T. mains and of static sub-station plant. Applicants must have a proper theoretical and technical training, and practical experience and possess initiative. Persons having drawing and estimating experience will be at an advantage. The commencing salary will be in accordance with the National Joint Board Schedule, Grade 10, Class G, £219 18s. per annum. The post being subject to the provisions of the Local Government Superannuation Act, 1937, the selected candidate will be required to pass a medical examination.—Full particulars of training, experience and age, together with copies of recent testimonials, to be sent to Box 669, c/o The Electrical Review.

ASSISTANT Foreman required for Specialist Works manufacturing switch fuses and L.T. switchboards. Opportunity for young man with sound training in the above and in production methods.—State age, education, experience and salary required to Box 676, c/o The Electrical Review.

ASSISTANT required in office of old-established electrical contractors in Cardiff. Must have experience in interviewing clients, taking off quantities, estimating and supervising men. Opening offering prospects of advancement for man with initiative, ambition and not afraid of work.—Apply, giving full particulars of past experience, together with copies of testimonials and remuneration required, to Box 706, c/o The Electrical Review.

SITUATIONS VACANT.—*Continued.*

ASSISTANT to Works Manager required for factory engaged on light mechanical and electrical work. Write, stating experience and salary required.—Box 717, c/o The Electrical Review.

CABLE Representative required for the Midlands by well-known firm of cable makers. Must have established connection with collieries and heavy industries.—Write in confidence, giving full particulars and salary required, to Box 595, c/o The Electrical Review.

DESIGNER.—Experienced Designer required for medium and large size continuous current dynamos, motors and large converting plant. Attractive position for live man with initiative and wide experience.—Apply, giving details of training, subsequent experience and salary suggested, to Box 760, c/o The Electrical Review.

DEVELOPMENT Engineer required for audio frequency amplifiers, power units, microphones and loud speakers. Knowledge of radio receivers an advantage.—Applicants should state age, experience and salary required, to Box 747, c/o The Electrical Review.

DRAUGHTSMAN, Electro-Mechanical, age about 25. State experience and salary required.—The Rapid Magnetting Machine Co., Ltd., Lombard Street, Birmingham, 12. 9187

DRAUGHTSMAN for electric motor control gear required by important Midland manufacturers for development work. Experience on gear for A.C. motors up to 20 H.P. essential. State age, experience, salary required.—Box 9154, c/o The Electrical Review.

DRAUGHTSMAN—Mechanical-Electrical with experience of Transformer Design. Apply stating age, experience and salary required to Box 527, c/o The Electrical Review.

DRAUGHTSMAN required, experience in L.T. electrical switchgear.—Reply, stating experience, age and salary required, to Messrs. Dewhurst & Partner, Ltd., Inverness Works, Hounslow, Middlesex. 714

DRAUGHTSMAN—Senior, with experience in Electric Control and Contactor Gear Design. Applications, with full details of experience, qualifications, age and salary expected to Box 528, c/o The Electrical Review.

DRAUGHTSMEN for E.H.T. metalclad switchgear, cubicles, kiosks and L.T. flatback switchboards.—State age, experience and salary required, to Brush Electrical Engineering Co., Ltd., Loughborough. 729

DRAUGHTSMEN required (senior and junior) experienced in any of the following:—(a) Hight and Low Tension Switchboards. (b) Industrial Control Gear. (c) Metaclad Switchgear and Oil Circuit Breakers. (d) Design of Contactors. Good mechanical draughtsmen without electrical experience would be considered for items "b," "c" and "d."—Apply, stating age, experience, technical education and salary required, to The General Electric Co., Ltd., Switchgear Department, Witton, Birmingham, 6. 718

DRAUGHTSMEN (Senior and Junior) with good general knowledge of transformers.—State age, experience and salary required, to Johnson & Phillips, Ltd., Charlton, London, S.E.7. 597

DRAUGHTSMEN—Senior and Junior with mechanical and electrical experience. Men having industrial motor or control gear designing experience preferred. Midlands works. Replies stating age, experience and salary required to Box 529, c/o The Electrical Review.

ELECTRIC Lamp Manufacturers have a few vacancies on their salaried Sales Staff. Men with established connection preferred.—Write, giving full particulars, to Box 9108, c/o The Electrical Review.

ELECTRICAL Engineer and Contractor carrying out only a good class of contracting work, starting own London business, seeks qualified engineer with previous contracting experience. Age approx. 30 to 40. Good salary to suitable man. Write giving all obvious particulars.—Box 9074, c/o The Electrical Review.

ELECTRICAL Engineer required, with sound works experience and organising ability, as Works Manager with small firm manufacturing special transformers in London.—Write, stating age, full details of experience and salary required, to Box 656, c/o The Electrical Review.

ELECTRICAL Fittings Manufacturers require Representatives with connection. Good commission.—Box 670, c/o The Electrical Review.

ELECTRICIAN and Handyman required for private estate 50 miles of London. One with suction gas engine experience, capable of undertaking all electrical work and maintenance of water supply from artesian borehole. The position is suitable for married man as cottage is provided. State age, and qualifications, if married, number of family, and wages required.—Write to Mrs. C. E. Gunther, Tongswood, Hawkhurst, Kent. 792

ELECTRICITY House Limited, require several fully qualified and experienced Lady Demonstrators, preferably holding the E.A.W. Certificate or Diploma. Excellent prospects with good salary and commission.—Apply by letter to MMC/D, Electricity House, 36, York Place, Leeds, 1. 754

SITUATIONS VACANT.—*Continued.*

ENGINEER, age 22-23, Public School and College trained with degree or diploma, required for commercial post British firm in Calcutta. Starting salary about £550 with annual increases. Good prospects. Write, stating age, full particulars schooling, training, interests, sports, etc.; present occupation.—Box 9156, c/o The Electrical Review.

ESTIMATING Assistant required for electrical contractors' office in Midlands. Give full particulars in confidence of past and present employment, age, salary, and when at liberty. —Box 732, c/o The Electrical Review.

FOREMAN required in West of England, for A.C. motor manufacture, with winding and machine shop experience. State age, experience and salary required.—Box 749, c/o The Electrical Review.

IMPROVERS, Electric Motor repair shop, fitting, assembling and breakdowns; London.—Box 784, c/o The Electrical Review.

JUNIOR Technical Assistant required for transformer design office of Electrical Manufacturers in North London. Previous experience in transformer design preferable but not essential. Apply, stating age, qualifications and previous experience.—Box 716, c/o The Electrical Review.

JUNIOR wanted for Sales Office of electrical manufacturers in North London, age about 16. Some experience an advantage but not essential.—Write Box 736, c/o The Electrical Review.

JUNIOR Draughtsman required, with experience in mechanical design of A.C. and D.C. machines.—Apply, stating age, salary and experience, to Chief Draughtsman, Engineering Drawing Office, General Electric Co., Ltd., Witton, Birmingham, 6. 775

LAMP Sales Representative required immediately by important firm of non-association manufacturers. Territory: Kent, Sussex and Hampshire. Remuneration by way of salary, commission and expenses.—Please write, giving full details of experience and remuneration required, to Box 781, c/o The Electrical Review.

PATENT Department of large electrical manufacturing firm has vacancy, as technical assistant to Patent Agent, for University Graduate in electrical engineering or physics. Good opening for capable man wishing to become a qualified Patent Agent. Previous Patent experience not essential provided applicant has first-class technical qualifications.—Reply in confidence, giving age, qualifications, experience and some indication of salary expected, to Box 9101, c/o The Electrical Review.

PHYSICIST or Electrical Engineer with experience in testing mechanical and electrical properties of insulating materials, wanted for laboratory of laminated plastics manufacturers. Applicants should state qualifications, experience and salary required.—Box 9126, c/o The Electrical Review.

REPRESENTATIVE for wholesale distributors with definite established connections wiring contractors, works South London area. State full particulars.—Box 795, c/o The Electrical Review.

REPRESENTATIVE, with good connection, for calling upon architects, consulting engineers, builders, public authorities and others, required by old-established firm of electrical contractors.—Apply, stating full particulars and remuneration required, to The Secretary, Speedy & Eynon, Ltd., 22, Essex Street, W.C.2. 9172

REPRESENTATIVES for Electric Lamps. Must be keen and preferably have good connection, but not essential. Good terms and high commission paid.—Apply by letter only, giving references and previous experience, in confidence, to Megalux Co., Ltd., 199, Old Street, London, E.C.1. 9116

REPRESENTATION. Manufacturers Electric Fires, having large range carrying, inset and wall fires, require Representatives with established connections with electrical wholesalers, Corporation Supply Authorities and builders' merchants. Territories: 1, Yorkshire. 2, Northumberland, Durham, Cumberland, and Westmorland. 3, South Western Counties. 4, Wales. Good discounts to the trade offered and sound commission terms to Representatives.—Box 9082, c/o The Electrical Review.

REQUIRED, Assistant Engineer (Electrical) Salesman by well-known firm specialising in electric contacts, switchgear contacts and electrodes (resistance welding), materials, etc. State age, previous career, experience, salary required, and send references.—Box 619, c/o The Electrical Review.

RESIDENT Salesmen required to exclusively represent oldest established electric washing machine manufacturers. Required to sell through own appointed dealers in leading towns. Excellent opportunites.—Apply by letter to Hurley Machine Co. (England), Ltd., 55-59, Oxford Street, W.1. 785

SALES Office Correspondent wanted for electrical manufacturers in North London, age about 21. Some electrical knowledge an advantage. Write, giving full details and salary required.—Box 735, c/o The Electrical Review.

SITUATIONS VACANT.—*Continued.*

SENIOR and Junior Draughtsmen required by Electrical Manufacturers in North London. Previous experience in the design of switch and transformer gear desirable but not essential. Apply, stating age, qualifications, experience and salary required.—Box 715, c/o The Electrical Review.

SERVICES of Electrical Engineer required to write course "Meters and Measuring Instruments" for I.E.E. examination syllabus.—State qualifications to the Governors, Bennett College, Ltd., Sheffield. 9186

SHADE Manufacturers in West End require for certain areas in Provinces and Home Counties Representatives, must have car, non competitive lines not objected to, good commission paid.—Box 755, c/o The Electrical Review.

SWITCHBOARD Attendant wanted for industrial works power house, used to paralleling 3-phase alternators and rotary convertors.—Box 531, c/o The Electrical Review.

SWITCHGEAR Draughtsmen required for H.T. kiosks, cubicles, etc., and L.T. flatbacks and ironclad gear.—Apply, stating age, experience and salary required, to Johnson & Phillips, Ltd., Charlton, London, S.E.7. 758

WANTED immediately, Armature Winder with experience on AC/DC machines, fractionals and up to 2 H.P., also experience on contactors, control gear, and small mechanisms. Permanent position with good prospects for suitable man.—Write, giving full details of age, experience and wage required, to the Nelson Engineering Co., Ltd., Netherfield Road, Nelson, Lancs. 9153

WANTED, Manager for factory in Far East, manufacturing small electrical machines. Appointment offers scope and possibilities to first-class trained electrical engineer having manufacturing experience, organising and administrative ability, initiative, ability control native staff and labour. Initial period of service to be agreed. Reply, stating age, salary required, and particulars of qualifications and experience in detail.—Box 638, c/o The Electrical Review.

X-RAY Engineers.—Competent Service Engineers required, indoor and out. Apply by letter in first instance.—Newton & Wright, Ltd., 68, Ballards Lane, London, N.3. 9150

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

WOLVERHAMPTON—Showroom Assistant.

SITUATIONS WANTED.

SALESWOMEN AND DEMONSTRATORS.

A NUMBER of SALESWOMEN and DEMONSTRATORS having completed specialised Electrical Training require posts. Apply to:—

London School of Electrical Domestic Science,
Bureau K, Imperial Court, 2, Basil Street, London, S.W.3. 348

A BRITISH born subject, 26, D.F.H., Grad I.E.E., general training in electrical and mechanical engineering, desires progressive position calling for initiative and hard work in British Isles or Colonies. Very keen and conscientious worker. Not radio.—Box 9113, c/o The Electrical Review.

A CAPABLE man, 17 years' experience electrical industry, covering accounts, buying, sales, secretarial and departmental management, requires progressive employment by reputable English company.—Box 9136, c/o The Electrical Review.

A WORKS Manager, qualified Electrical and Mechanical Engineer, accustomed to light accurate work, knowledge of meter and measuring instruments. Good organiser, disciplinarian, tactful. Desires change in similar position. Salary not less than £750 per annum. London district only.—Box 9118, c/o The Electrical Review.

A YOUNG Man, 24, with practical experience of general electrical equipment and a specialised knowledge of static apparatus, would accept position, offering scope and experience, for a nominal wage.—H. Pitt-Bayly, 51, Wallingford Avenue, London, W.10. 9147

ADVERTISER, 28, general training in electrical engineering and considerable sales experience in Midlands and the South, desires position either as Representative or Assistant Sales Manager or Sales Manager.—Box 9184, c/o The Electrical Review.

AN "E.D.A. Sales Engineers' Diploma," holder seeks an opportunity to prove his sales and organising abilities. Fourteen years' sales and general electrical experience with public authorities and supply companies. Present position Corporation Electricity Department Showroom Manager. Position must offer a wide scope with full responsibilities and adequate remuneration.—Box 9152, c/o The Electrical Review.

AN experienced Electrician, Higher National Certificate, 10 years in the trade, desires progressive position in motor repairs, maintenance, rewinds and conversions or wiring.—Box 9164, c/o The Electrical Review.

SITUATIONS WANTED.—*Continued.*

ARMATURE Winder, repairs and rewinds. London district; over 50; E.T.U. rate.—Box 9171, c/o The Electrical Review.

BIRMINGHAM District. Please see advertisement commencing "Sales Manager, aged 36 . . . . . " 9122

CAPABLE Clerk, used to staff control, credit sanctions, correspondence, accounts, seeks change.—Box 9166, c/o The Electrical Review.

CAPABLE Electrician's Mate, 5 years' experience, installation maintenance; thorough knowledge all systems.—Box 9080, c/o The Electrical Review.

CHARGE Hand, electrician, estimator, competitive, young, requires post as Estimator Supervisor; London Area; all systems light, heat, power, etc.—Box 9102, c/o The Electrical Review.

CONTINENTAL Engineer, 24, University degree. Special knowledge in electricity, mechanics, hydraulics, thermodynamics, several months' practice, seeks position.—Box 9151, c/o The Electrical Review.

DISENGAGED Foreman Electrician, City and Guilds Electrician's Certificate, experienced power, ex A.M. contract, expert on hutted camps, go anywhere.—Box 9158, c/o The Electrical Review.

ELECTRICAL and Mechanical Engineer, 45, married, wants anything offering scope; sales, inspection, installation, maintenance, mains, etc. Training: articled to city electrical engineer and municipal school of technology, Manchester. Experience: switchboard atténdant in charge of D.C. 3-wire traction and 3-phase supplies; mains department large power company, manager general engineers and contractors, resident manager for hydro-electric power company out East, managing director of electrical contractors. General: 11 years' teaching experience in engineering subjects at technical schools.—Box 9083, c/o The Electrical Review.

ELECTRICAL Engineer, 12 years' wide experience, including test bed, manufacture electrical plant and equipment, national certificate. Good references.—15, Moorgate Avenue, Liverpool, 23. 9132

ELECTRICAL Engineer, 25 years' experience all branches plant, erection, maintenance, wants permanent position. Highest references. (London.)—Box 9110, c/o The Electrical Review.

ELECTRICAL Engineer, 37, holding responsible position with important electricity supply undertaking, good draughtsman, seeks post with firm or municipality in India. Speaks five languages.—Box 9188, c/o The Electrical Review.

ELECTRICAL Engineer, 38, desires change. Experienced all systems, plants and engines, estimate, supervise, 12 years own business, go anywhere.—Box 9165, c/o The Electrical Review.

ELECTRICIAN, age 35, fully experienced all branches electrical installation work, used to costing and estimating, past 10 years own business, seeks progressive, permanent situation.—Box 9168, c/o The Electrical Review.

ELECTRICIAN Wireman (T.U.), good all-round experience.—6, Westbourne Buildings, W.2. 9170

ELECTRICIAN-Wireman wants job, any system.—F., 4, Chester Cottages, Bourne Street, Chelsea, S.W.1. 9084

ELECTRICIAN-Wireman, 15 years' experience, all systems, —Murkett, 95, Ascot Gardens, Southall, Mddx. 9120

ELECTRICIAN, 20 years' experience contracting work and factory maintenance.—Jordan, 23, Hillfield Avenue, N.8. 9086

ELECTRICIAN (42), mate (19), light, heat, power. All systems. Distance no object; highest references.—Electrician, 29, Poplar Street, Mawney Road, Romford, E. 9142

GENTLEMAN (32), requires progressive post as cashier or senior accounts clerk with electricity undertaking; wide experience.—Box 9167, c/o The Electrical Review.

MANAGER (45), electrical shop and design, also good knowledge machining operations, office work, costing, etc.—Box 9149, c/o The Electrical Review.

METER Engineer with thorough electrical and mechanical experience of all types of A.C. and D.C. meters and instruments, manufacturers, London and Provincial experience, good references, desires change.—Box 9160, c/o The Electrical Review.

POSITION desired as trainee in some department of electric light and power company, electric railway company, manufacturing company. Previous experience in meter and sub-station of New York company; ex-serviceman (Royal Navy).—E. L., 29, Denmark Road, Northampton. 9169

PLUMBER Jointer, age 31, seeks situation; 9 years' practical experience as same; fully experienced in E.H.T., L.T. work.—Dearman, 18, Brainton Avenue, Feltham, Middx. 9054

REPRESENTATIVE, connection London and suburbs, small salary and commission.—Box 9185, c/o The Electrical Review.

(Continued on Sup. 20)

BROOK INDESTRC

GUARANTEED AGAINST INTERNAL EC

YEARS, IRRESPECTIVE OF PHASE FAR E

IMPOSED. APPLICABLE TO NEARLY Y

AS PIONEERS OF MANY OF THE IMPORTANT MODIFICATIONS IN ELECTRIC M BRO
PRESENT A FURTHER IMPORTANT IMPROVEMENT—INDESTRUCTIBLE MOTORS CAN
INSULATION IMPERVIOUS TO HEAT AND GIVING GREAT RESISTANCE TO CTIC

Specification

The mechanical construction of INDESTRUCTIBLE motors is the same as for standard machines, except that terminal TRIFURCATING BOXES may be fitted for abnormal atmospheric conditions.

Electrically, however, the motor is entirely modified. All copper wires are doubly covered with vitreous fibre braid, having a melting point of 1,900°F and consequently impervious to the action of heat. This vitreous fibre has great tensile strength, is as thin as silk and is resistant to all acids except hydrofluoric acid. Owing to the thin covering with vitreous braid, the slot factor, and hence the electric performance of INDESTRUCTIBLE motors, is slightly better than in standard machines.

Slot insulation is mainly of mica and vitreous cloth, coil insulation is of vitreous braid and asbestos, whilst there is a further protection of mica between phases. Vitreous tubing further protects all leads and connections. All connections are welded.

CLASS "B" INSULATION

The INDESTRUCTIBLE Brook motor complies fully with the requirements of B.S.S. 168-1936. However, its insulation comes under class "B," which would permit a temperature rise of 55°C instead of 40°C, and 65°C instead of 50°C, on Protected and Totally Enclosed types, respectively.

Output

It is to be emphasised that there is no intention to increase output, above that of standard listed frames, rather is it to increase the reliability under conditions where ANY standard make of motor would fail.

All outputs are as listed in General Catalogue No. 480. The INDESTRUCTIBLE method of insulation can be applied to any CAGE motor to a maximum frame, size R15 (approx. 20 h.p.).

INDESTRUCTIBLE MOTORS

are insulated with

Double Vitreous Covered Wire
Vitreous-Mica Slot Insulation
Vitreous Binding Tape
Mica Spaced Coils
Vitreous Insulated Leads
Indestructible Slot Wedges
Welded Connections

BROOK M

PIONEERS IN THE DESIGN AND MANUFA R

HUDDERSFIELD • BIRMINGHAM • BRISTOL • GLASGOW • LEEDS CE

RCTIBLE MOTORS

ALECTRICAL FAILURE FOR TWENTY
ARE OR THE AMOUNT OF OVERLOAD
LY TYPE OF BROOK MOTOR.

C M BROOK MOTORS LIMITED PROUDLY
ORS CANNOT BE BURNT OUT, HAVING
TO ACTIONS OF ACIDS AND MOISTURE.

Alternative Applications

NORMAL ATMOSPHERIC CONDITIONS

ndestructible motors are first offered for normal atmos-heric working conditions, where the air is reasonably ean and dry. In such conditions normal protected type otors with vitreous insulation are capable of dealing ith heavy overload, phase failure or voltage variation ithout damage.

BNORMAL ATMOSPHERIC CONDITIONS

Where these conditions apply it may be necessary for Brook Engineer to visit the site to offer an approved ype. Where acid, moisture, or dust is present, surface ooled motors must be used, and a trifurating box fitted to he stator terminals.

Test for Yourself—*with this Comparative card.*

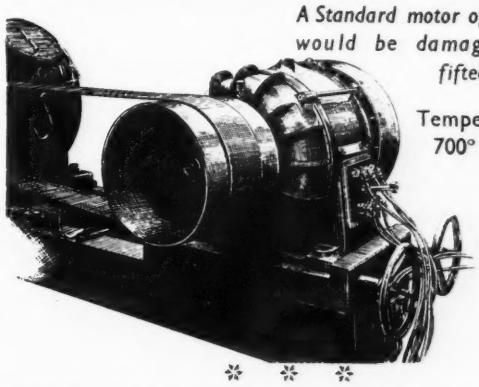
497 gives all
ils. Post free on request.

Tests
Taken on INDESTRUCTIBLE MOTORS without harm.

DOUBLE FULL LOAD for SIX HOURS

A Standard motor of any make would be damaged within fifteen minutes.

Temperature rise 700° fahrenheit



* * *

ONE PHASE OPENED FOR SIX HOURS ON FULL LOAD.

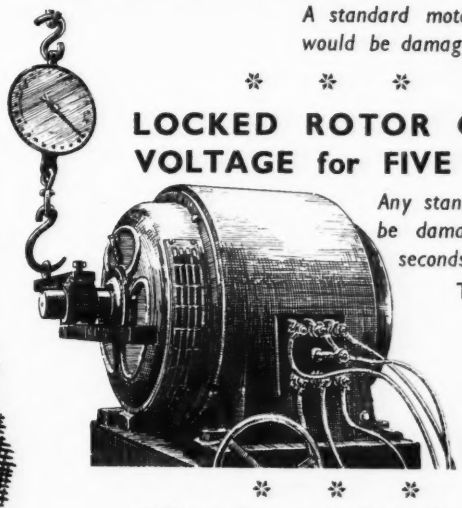
A standard motor of any make would be damaged by this duty.

* * *

LOCKED ROTOR ON FULL VOLTAGE for FIVE MINUTES

Any standard motor would be damaged after thirty seconds.

Temperature rise 500° fahrenheit



* * *

THIRTY THOUSAND STARTS

with rotor locked full voltage was applied thirty times per minute continuously.

Any standard motor would be damaged within five minutes

Temperature rise 700° fahrenheit

MOTORS LTD

FAIRE OF ALTERNATING CURRENT MOTORS

DS CESTER • LONDON • MANCHESTER • NEWCASTLE • SHEFFIELD

SITUATIONS WANTED.—*Continued.*

SALES Manager, aged 36, of proved ability to organise and increase sales, seeks position with firm of good repute. Thorough knowledge of the trade obtained from many years' experience in marketing for leading manufacturers; a wide range of accessories, ironclad gear, fittings and specialities. Accustomed to controlling representatives and staff, estimating, orders, publicity; good technical knowledge and d.o. training. Excellent references.—Box 9121, c/o The Electrical Review.

STOREKEEPER (25) desires progressive position with manufacturer or wholesaler; thorough knowledge of lighting, wiring accessories and domestic appliances.—Box 9088, c/o The Electrical Review.

WIREMAN, power, light, etc., A.C.-D.C., all systems; excellent references.—15, Horsfeld Road, S.E.9. 9105

WIREMAN, 38, disengaged, good all round.—A. F., 208, Cambridge Rd., Kilburn, W. 9161

YOUNG Engineer, 23, secondary education, 4½ years' apprenticeship, City Guilds Certificate. Experienced large lighting, power distributions, auto telephones. Good knowledge layout, estimating, seeks post, contractors' or works engineers' office, or any progressive post.—Box 9163, c/o The Electrical Review.

AUCTION NOTICE.

Advertisements under this display section are inserted at 14s. per inch (minimum one inch).

Important SALE of ELECTRICAL MACHINERY consequent on Expiration of Lease, at THE SHIP-BREAKING YARD, PORTISHEAD DOCKS
(Bristol 7 miles).

MR. A. VICTOR OSMOND

has received instructions from Messrs. W. G. Keen & Co. to SELL by AUCTION, on WEDNESDAY, JULY 5th, 1939, WITHOUT RESERVE, Machinery, including about 25 various Electric Motors and Dynamos; House Lighting Sets; Switchboards, &c. SALE at Ten o'clock. Catalogues of the Auctioneer, 46, Bridge Street, Bristol. 720

FOR SALE.

Advertisements under this display section are inserted at 14s. per inch (minimum one inch).

CITY OF MANCHESTER.

Electricity Department.

SURPLUS PLANT FOR SALE.

TENDERS are invited for the purchase, dismantling and removal from SUB-STATIONS of the following PLANT:—

HARPURHEY:
2 Transformers, 500 kVA, oil immersed, 3 phase, 50 cycle, 6,400/11,000-11,175 volts.

WITHINGTON:
1 750 kW MOTOR CONVERTER, 3 phase A.C., 50 cycle, D.C. 6,450/400-530 volts, R.P.M. 1,000.
1 750-kW MOTOR CONVERTER, 3 phase, A.C. 50 cycle, D.C. 6,450/400-440 volts, R.P.M. 750.
2 220 kW MOTOR GENERATORS, 3 phase A.C., 50 cycle, D.C. 6,500/500-550 volts, R.P.M. 500.

BENNETT STREET:
2 220 kW MOTOR GENERATORS, 3 phase A.C. 50 cycle, D.C. 6,500/500-550 volts, R.P.M. 500.
1 100 kW BALANCER, 3 phase A.C. 50 cycle, D.C. 6,500/205-225 volts, R.P.M. 480.

DENTON EAST, MOSS SIDE AND POLYGON:
3 100 kW BALANCERS, 3 phase A.C. 50 cycle, D.C. 6,500/205-225 volts, R.P.M. 480.

(The Plant can be inspected by appointment.)

Particulars and Forms of Tender may be obtained on application to Mr. H. C. Lamb, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2.

Tenders, duly endorsed, and addressed to the Chairman of the Electricity Committee, must be delivered at the Town Hall not later than 10 o'clock a.m. on Thursday, 13th July, 1939.

The Corporation does not bind itself to accept the highest or any tenders.

R. H. ADCOCK,
Town Clerk.

Town Hall,
Manchester, 2.
26th June, 1939. 765

FOR SALE.—*Continued.*

SPECIAL OFFER.

TWO MATHER & PLATT, 400 volts, 3-phase, 50 cycles, SQUIRREL CAGE INDUCTION MOTORS; 2-speed pattern each developing 225 H.P. at 975 r.p.m., also 110 B.H.P. at 725 r.p.m., being of the 2-bearing pedestal type on bedplate. Each complete with:—

MATHER & PLATT OIL IMMERSED AUTO-TRANSFORMER STARTERS comprising Main Circuit Breaker with overload and no-volt releases and time lags, mounted together with oil-immersed Auto-Transformer with change-over switch, the latter also incorporating a change-pole device.

TWO SETS DAVID BROWN REDUCTION GEARS, 14 in. centres, double helical, fitted with roller bearings, ratio 975/232 r.p.m. Each complete with Oil Pump.
TWO BROADBENT AUTOMATIC CENTRIFUGAL CLUTCHES to transmit 225 H.P. at 975 r.p.m. and 110 H.P. at 725 r.p.m.

Keen Prices for Immediate Sale.

GEORGE COHEN, SONS & CO., LTD.,
Stanningley, Leeds.

75

SALE BY TENDER.

For Sale.

ONE 18 in. dia., five 24 in. dia., and one 36 in. dia. "BLAKEBOROUGH" SLUICE VALVES, cast-iron bodies, brass seats and faces, with outside gunmetal screws, all in good condition.

For full particulars and permit to view, apply to Mr. W. N. C. Clinch, Engineer and Manager, Brighton Corporation Electricity Undertaking, "Electric House," Castle Square, Brighton, 1, to whom tenders must be submitted not later than 12 noon on Monday, 10th July, 1939. 764

MIDLAND COUNTIES ELECTRICAL ENGINEERING CO., LTD.,

Grice Street, Spon Lane, West Bromwich.

500 MOTORS, Dynamos, Rotary-Converters, 1,500 kW to 250 kW, 6-ring, 50 cycle to 220 and 440 volts D.C. Generator Sets, Switchgear Welders, Repairs, Rewinds and Installation Specialists. 6

ELECTRIC MOTORS AND DYNAMOS.

WE hold one of the largest stocks of New and Second-hand Motors. Second-hand machines are thoroughly overhauled. Inspection and tests can be made at our Works.

For Sale or Hire. Send your enquiries to:—
BRITANNIA MANUFACTURING CO., LTD.,
22-23, BRITANNIA STREET,
CITY ROAD, LONDON, N.1.
Telephone: 5512-3 Clerkenwell. 13

HALIFAX CORPORATION TRAMWAY MATERIAL.

E. J. WALSH & CO., Edinburgh, having purchased all material, including tramcars and other equipments, are disposing of same, and solicit enquiries.

E. J. WALSH & CO.,
11, Milton Road East, Edinburgh.
'Phone & 'Grams: "81724 Edinburgh."
796

GREENHALGH BROS.,

Burtons Field Hill, Atherton. Tel. 117.

WE carry a large stock of second-hand Electric Motors, Generators, &c. Every machine thoroughly overhauled, tested and Guaranteed for 12 months.

All enquiries receive prompt attention. 17

Advertisements are inserted in this section at 1s. 9d. per line per insertion.

A.—LARGEST stock Mirrors (sale or hire). Searchlights, surplus Carbon Rods, Instrument and Resistance Wires, Insulating materials.—London Electric Firm, Croydon. 520

FOR SALE.—*Continued.*

A.—Wide Angle Floodlights, 9,000 candle-power.—The London Electric Firm, Croydon. 719

A.C. and D.C. Motors, large stocks. Motor Generators and 3-phase Polishing Motors.—Milo Eng. Works, Milo Road, Dulwich, S.E.22. (Forest Hill 4422.) 8744

AERIAL Cables, all sizes, quoted for low prices.—Edwardes Bros., 20, Blackfriars Road, London. 9173

ALL Types of A.C. and D.C. Petrol Electric Generator Sets, Motors, Alternators, etc., up to 25 kVA. We can also supply special generator sets to order,—Chas. F. Ward, 46, Farringdon Street, London, E.C.4. Tel.: Holborn 9703. 19

ALTERNATING Sets, input D.C., 440 volt, output 220/1/50, 3 kVA, Crompton P., as new, with guarantee.—J. Gerber & Co., Ltd., Wembley, Mddx. 727

AMMETERS, Voltmeters, House Service Meters (quarterly and prepayment), a.c. and d.c., all guaranteed one year; low prices.—The Victa Electrical Co., 47, Battersea High Street, S.W.11. 'Phone: Batt. 0780. 7718

A.R. Protection.—Joseph Westwood & Co., Ltd., made the "Elephant Iron" type Shelter used in Great War.—For particulars write Napier Yard, Millwall, E.14. 35

BEST English Cables, 1/.044 and all standard sizes up to and inc. 127/.013, new guaranteed quality, low prices. Price lists.—Edwardes Bros., 20, Blackfriars Road, London. 9174

BLOWERS 0.5-2 h.p., 500 volts, D.C., of various descriptions, to clear.—Box 728, c/o The Electrical Review.

CONCRETE Cable Covers. We specialise in the manufacture of these. Send us your enquiries.—Louis G. Ford, Ltd., Eastbourne. 'Phone: 5000 (6 lines). 605

CONVERTERS, input D.C. 230 volts, output A.C. 230/1/50, as new, of various description, 20 available for quick clearance.—Gerber & Co., Ltd., Wembley, Middlesex. 724

D.C. Motors, ½-30 H.P., 110 volts, of all descriptions, from change-over.—Box 725, c/o The Electrical Review.

DELCO-LIGHT Plant, Model 8C3, 800 watt, 32 volt, 16 cell Chloride battery, type DBG 2, 60 A.H. Superseded by mains; seen running by appointment. Offers.—Allen, "Colboys," Blindley Heath, Lingfield. 'Phone: Lingfield 92. 753

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GENERATOR, 110 kW, 480 V, comp. 350 revs., E.C.C. Cheap.—Sugdens, Glenny Road, Barking. 776

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3,000 kW Turbo Generator, 6,000 volts, 3 phase, 50 periods.
1,000 kW Turbo Generator, 220 volts, D.C., with condensing plant.
100 kW Steam Set, Belliss preferred, 220 volts D.C.
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REQUIRED, direct coupled 3½ kW Diesel-driven Lighting Set, 50/70 volts, fully automatic preferred, complete with battery.—Box 757, c/o The Electrical Review.

TWO or three 1,500-kW to 2,000-kW Rotary Convertors or Motor Generators wanted for 11,000-volt, 3-phase, 50-cycles input, 250-volt D.C. output.—Box 750, c/o The Electrical Review.

WANTED, approximately 180 yards 61.093 or 37.093 V.I.R. Cable. Must be in good condition.—Write particulars and lowest price to J. H. Hayman & Co., Mountfield Road, East Ham, E.6. 759

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WANTED immediately for shipment, good second-hand Crude Oil Engines, Dynamos, Motors. Prompt cash on inspection.—Fred Watkins, Coleford, Glos. 38

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WANTED, 220 volt D.C. Motors, 8 H.P. to 20 H.P.—Box 752, c/o The Electrical Review.

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PROVINCIAL Distributors required to aggressively and exclusively promote the sale of domestic Electric Washers and Ironers, etc. Must be capable of entering market with adequate sales staff.—Apply by letter to Hurley Machine Co. (England), Ltd., 55-59, Oxford Street, W.1. 786

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PLUMBING and Electrical Contractors, well est. Yorks W.R. town, sale £3,000 p.a.; large existing contracts.—Robinson, Holmes's Chambers, Pontefract. 622

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MR. C. H. Coutts, A.M.I.E.E., a Director of Wilson & Herd, Ltd., Engineers, Johannesburg, is on a visit to England. He will visit Principals and any other firm interested. His address until the middle of August will be c/o Nathan & Allen, Ltd., 131, Victoria Street, S.W.1. 733

WEST End Showroom.—Electric fittings firm desires share with some other firm in electrical trade, established organisation.—Box 734, c/o The Electrical Review.

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DORSET HOUSE,
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LONDON, S.E.1

E.R.5

NOTICE

Advertisements for classified columns MUST reach us by

5.30 P.M. ON TUESDAY

E.R.6

COMPANY MEETINGS.

NEWTON BROTHERS (DERBY), LTD.

THE tenth Annual General Meeting of Newton Brothers (Derby), Ltd., was held on Wednesday, the 21st June, 1939, at the registered office, Alfreton Road, Derby.

Mr. P. C. Cooper-Parry said:—

The net profit for the year showed a satisfactory increase over last year, and was the result of a largely increased output which had been obtained by considerable plant additions and re-equipment and by continued works reorganisation.

Consequent on the prudent dividend policy over the past three years there had been a considerable improvement in the financial position, and for the first time for many years the liquid assets exceeded the liabilities as at 31st March, 1939.

As to the prospects for the coming year; from the evidence of the orders on hand, the state of trade generally and the enquiries coming through, he saw no reason why the trading results for the coming year should not approximate those for the year now disclosed. Further than that Shareholders would not expect him to go.

Commenting on the proposal to distribute one fully paid ordinary share of 2s. for each 2s. share held Mr. Cooper-Parry stated that the Directors were pleased to be able to make this recommendation and so restore to Shareholders a fractional part of the heavy capital reduction of some time ago.

A dividend of 12½ per cent. was declared and the Report and Accounts were unanimously approved.

Mr. Robert Mitchell, M.I.Mech.E., was re-elected a Director and Messrs. Watson, Sowter & Co. were re-appointed Auditors.

The meeting closed with a vote of thanks to the Chairman and the Directors and the whole of the staff and employees.

At the Extraordinary General Meeting which followed the Ordinary Meeting, the special resolutions authorising the bonus issue of shares referred to were unanimously approved. Allotment letters will be posted to Shareholders on Friday, 23rd instant, together with the dividend. 745

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Where Advertisements are to be answered to a given number at the ELECTRICAL REVIEW Office Applications for Names and Addresses of the Advertisers will be entirely disregarded, and Letters giving incorrect Box Numbers will be destroyed. E.R.2

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed. E.R.1

Don't buy a Trailer Fire Pump before seeing the

National Physical Laboratory Report on the BERESFORD STORK TRAILER PUMP

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We know of **no other** trailer **pump** submitted to such a **drastic test.**

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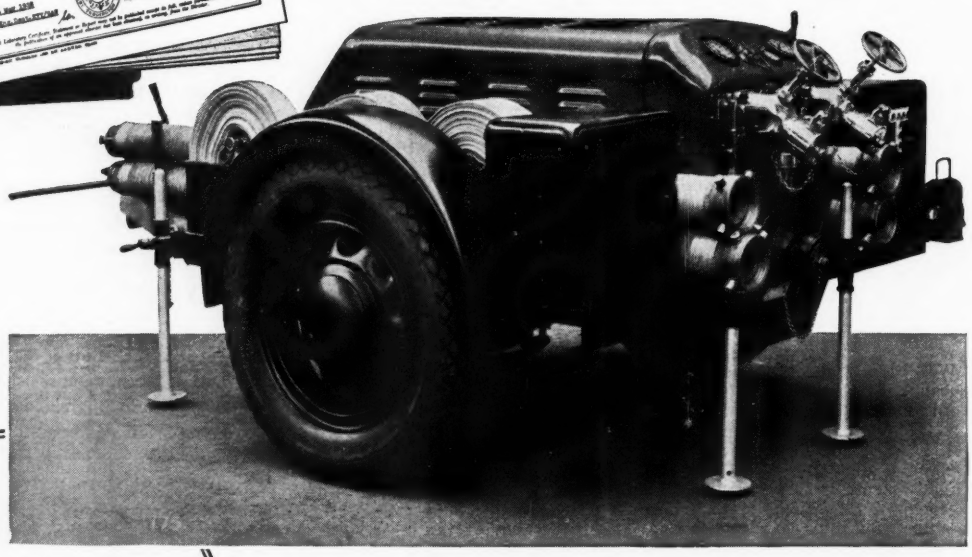

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LOW overall **HEIGHT.**
ENCLOSURE of engine and pump.

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BERESFORD-STORK SELF PRIMING pumps priming on 27-ft. suction lift in 8/12 seconds.
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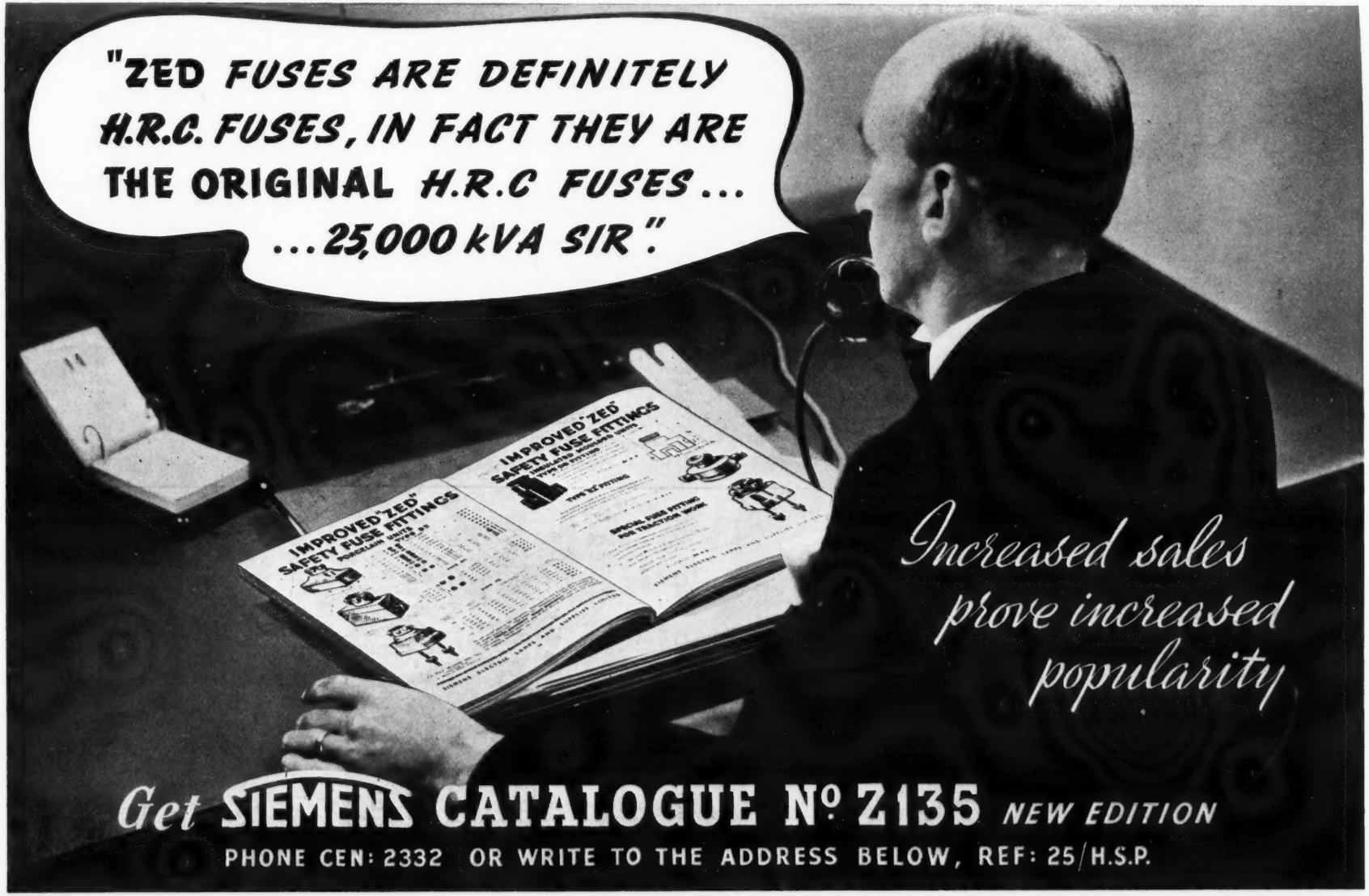
B.R.25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ELECTRIC REFRIGERATOR

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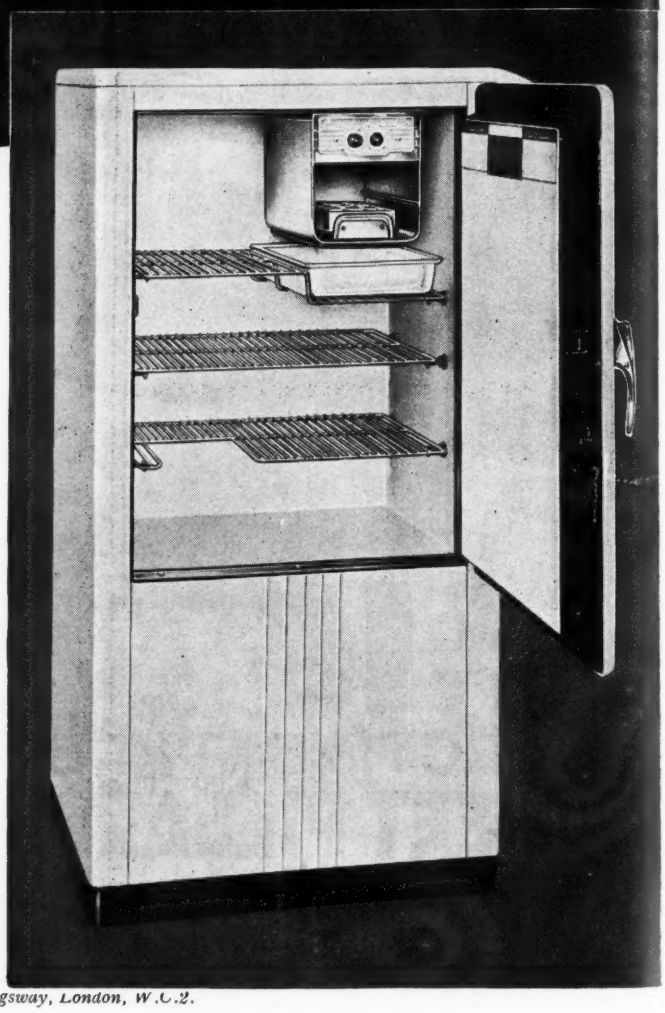

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Here is a new domestic cabinet of 3 cu. ft. storage capacity, that occupies NO MORE FLOOR SPACE than a 2 cu. ft. model—a boon in the modern kitchenette where choice, hitherto, was restricted to smaller models.

The extremely low price of the DMD.31 makes the usefulness of this extra space even more attractive.

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PRICE ONLY £27·10·0

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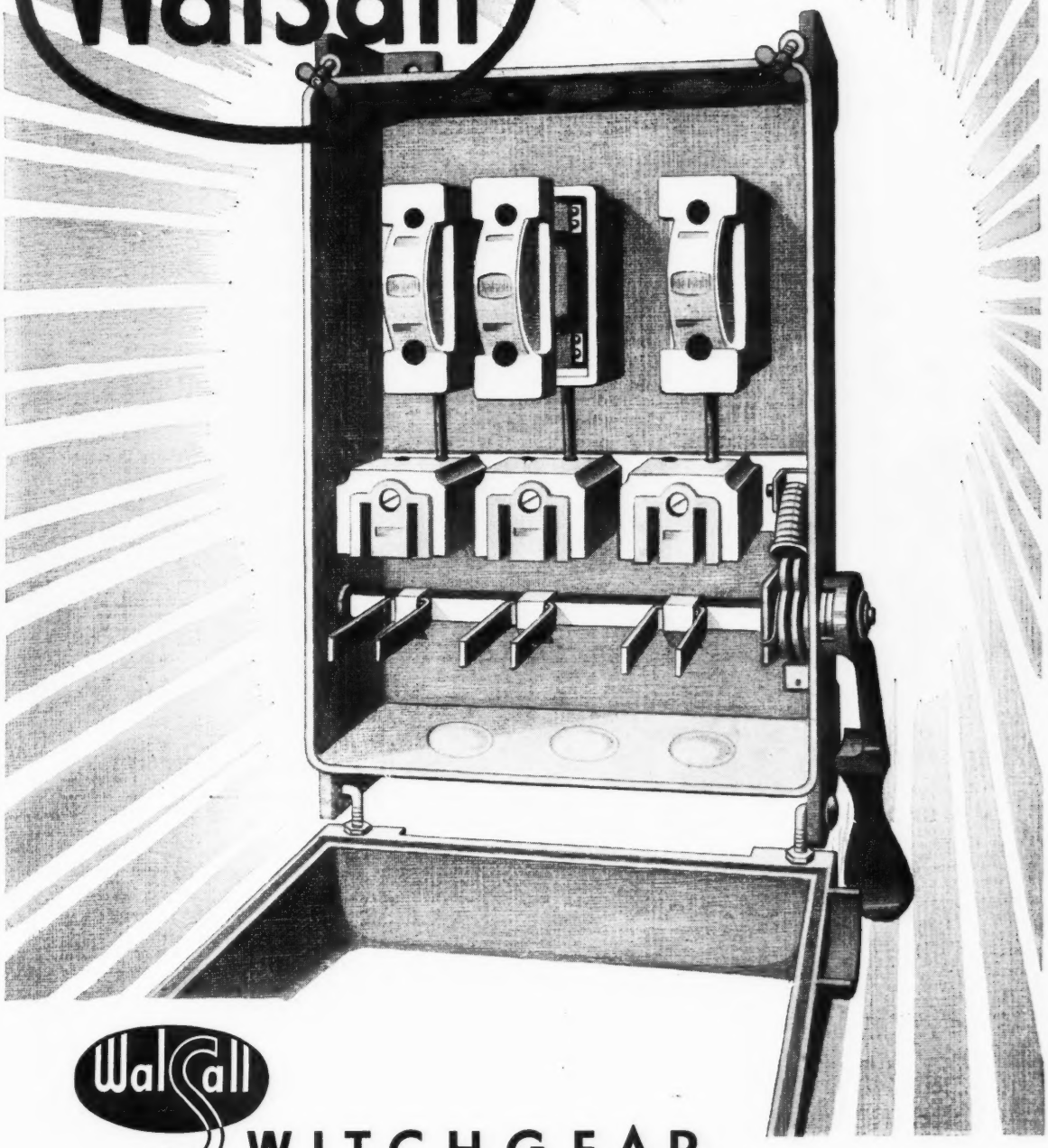
Walsall



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WRITE for the "Walsall" Wall-sheet and prove how RIGHT "Walsall" Switchgear is in quality and price.

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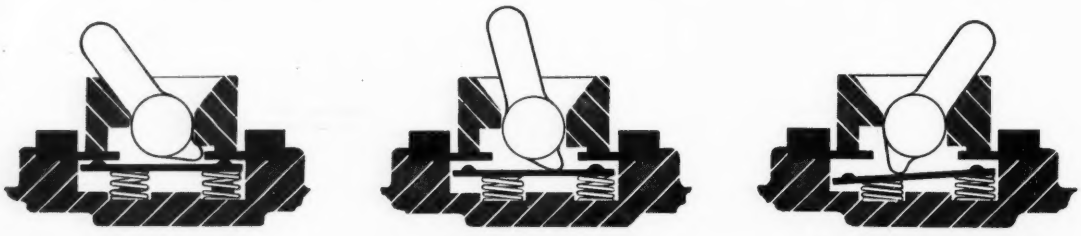
Fitted with the 'WYLEX' SWITCH



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AN IMPORTANT SUPPLY UNDERTAKING CARRIED OUT A TEST ON THE 'WYLEX' A.C. SWITCH IN THEIR LABORATORY.

TEST RESULT — **"400,000 operations 'on' and 'off' on a 32% overload. The test was discontinued because the switch is still in excellent order, and there is no point in carrying the test further."**

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SIEMENS V·I·R WIRES AND CABLES

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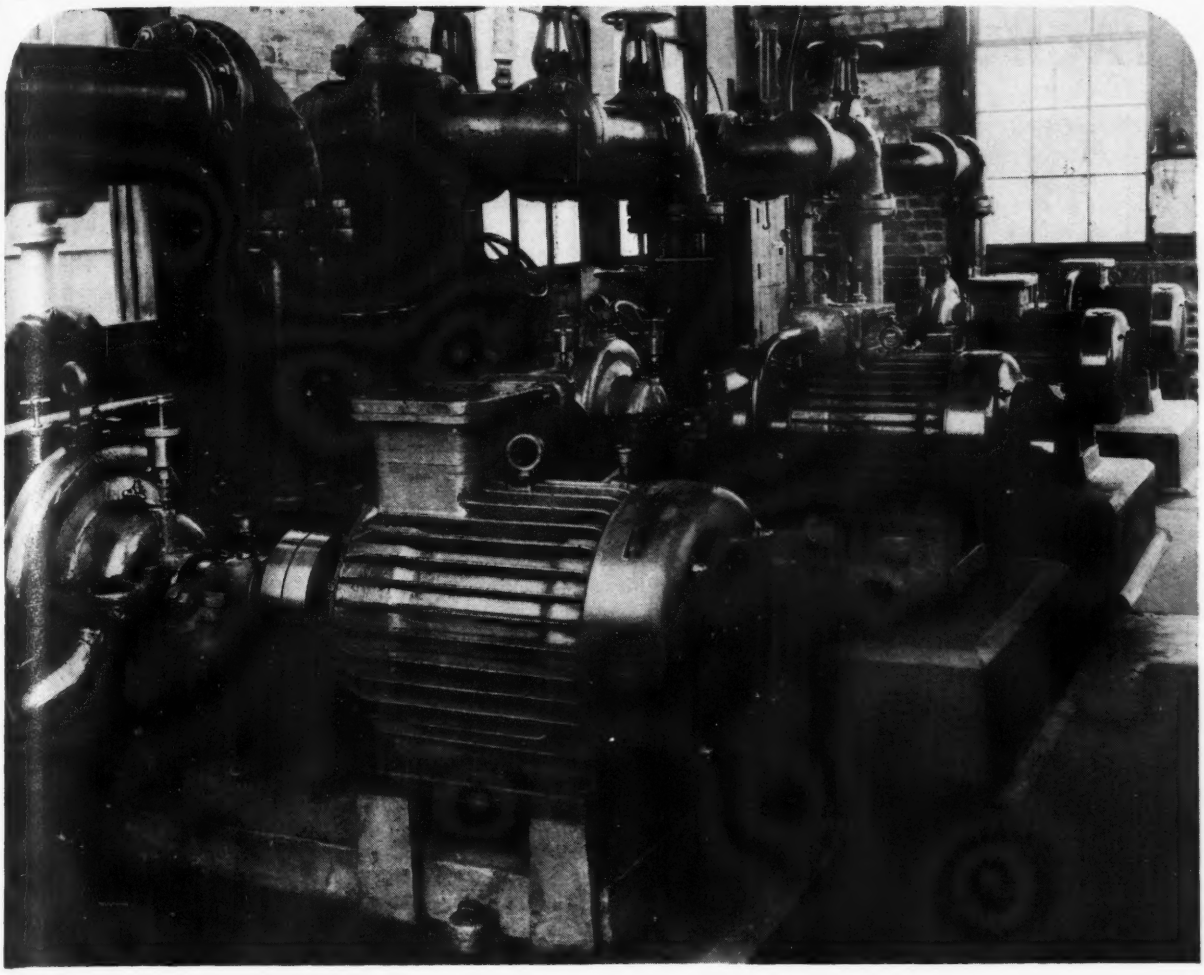

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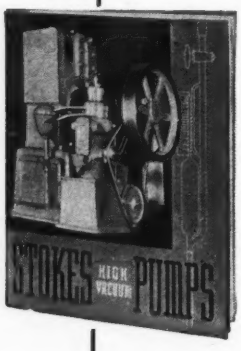

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Resistance units in mica, porcelain and asbestos.
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To his son remarked engineer White,
"This business is more than all right,
And when you take it over,
You'll still be in clover,
If you stick, like me, to FLUXITE!"

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It also serves for grease as an oil-can does for oil. Price 1/6 or filler 2/6.

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IT SIMPLIFIES *ALL* SOLDERING

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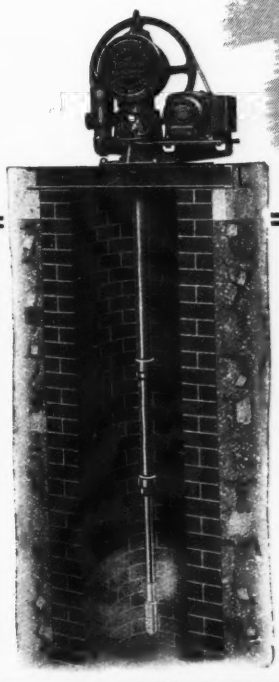

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LIMITED

THE LARGEST SPECIALIST MAKERS OF ELECTRIC MOTORS.

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Heatrae as Pepys might have put it.

This day I being extremely heated did enjoy a hot bath which to my surprise was truly hot. Whereon I afterwards did ask my wife why we suddenly did get such excellent service; at which she shewed me the electric device called a Heatrae that had been fitted during my absence with the fleet. It is certainly a wonderful piece of craftsmanship and I mighty pleased that my wife did show such excellent forethought did tell Bodgers of it when I met him. But he not impressed but rather surprised that I had not had one previous.

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LEADERS IN ELECTRIC HEATING

HEATRAE LIMITED, NORWICH. 'Phone: NORWICH 3491. 'Grams: HEATRAE, NORWICH.

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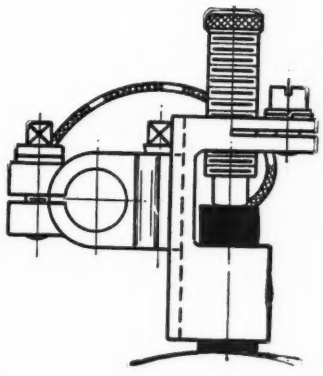

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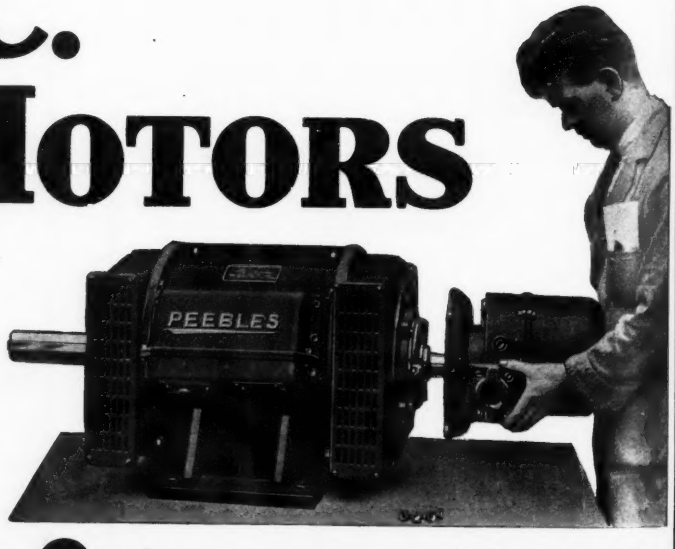
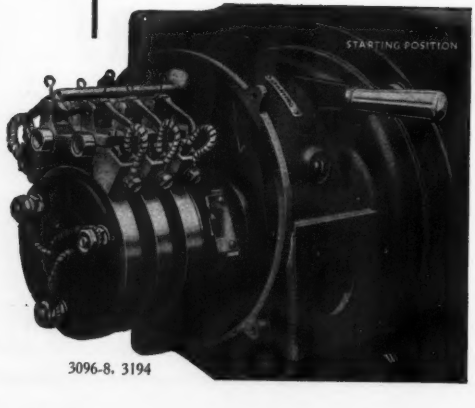


● Look into the features of this Slip-Ring Gear



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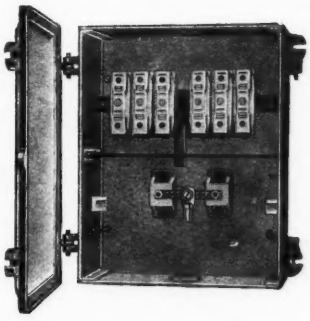

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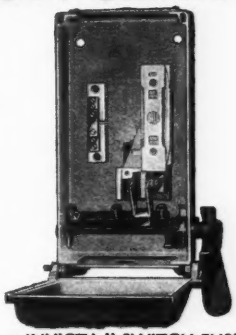

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FRACTIONAL HORSEPOWER MOTORS

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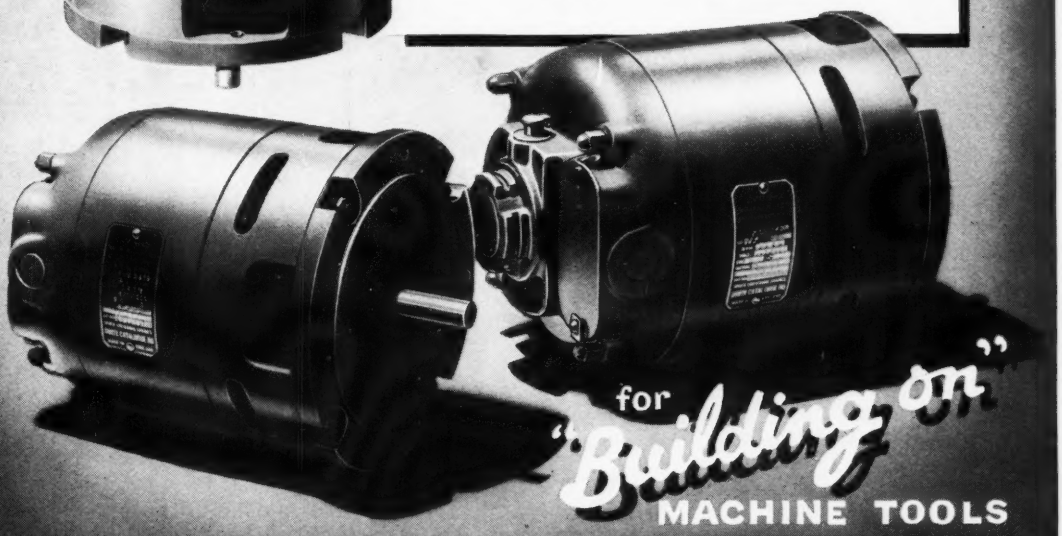

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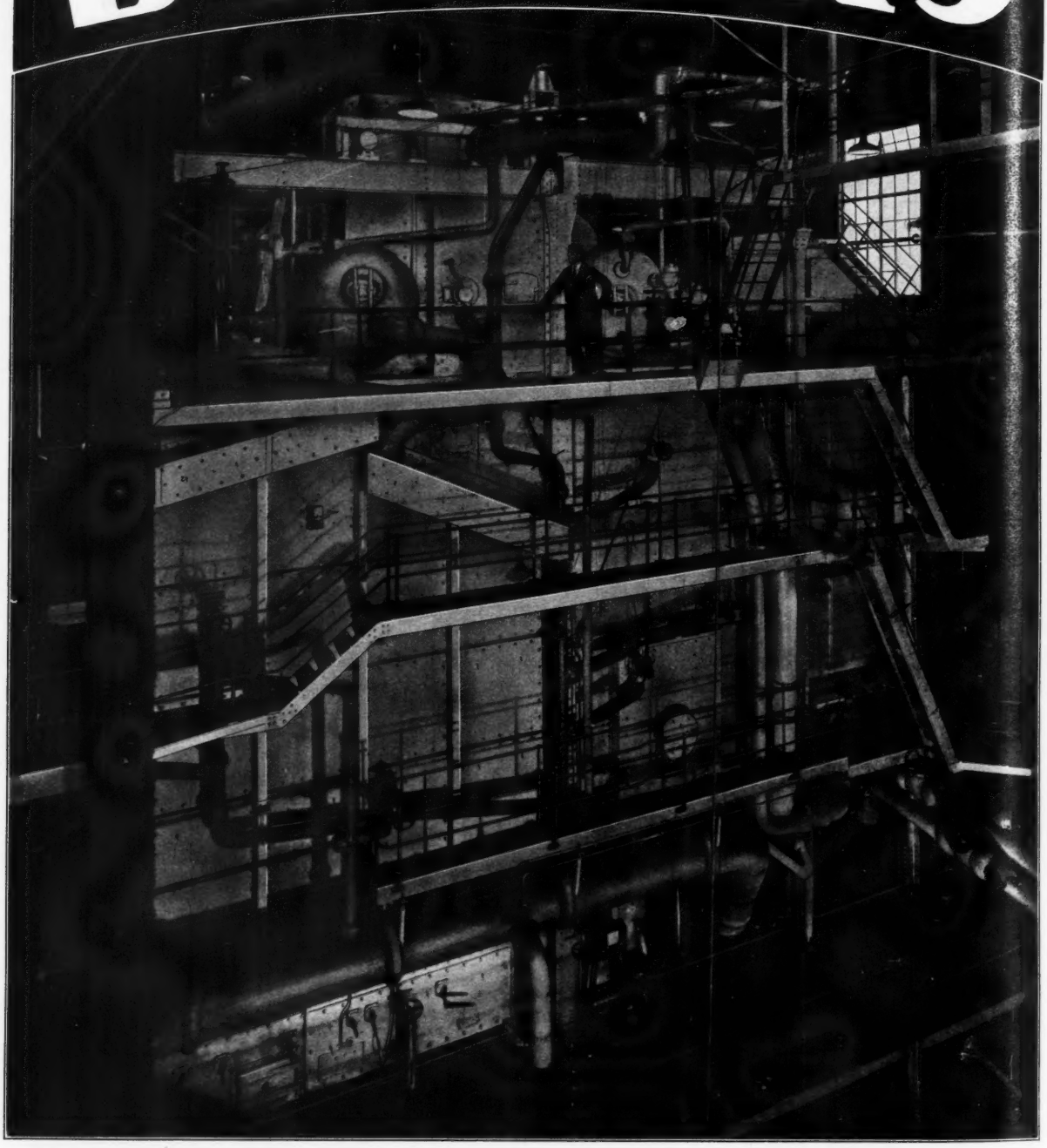

HACKNEY POWER STATION

The illustration shows part of the extensions at Hackney Power Station where two new Simon-Carves Boilers have recently been installed. There are now five Simon-Carves Tri-Drum "Twin-Flow" Circulation Boilers at this power station. Evaporation of each Boiler: 150,000 lbs. per hour at M.C.R., pressure 400 lbs. per sq. in., temperature 820°F.

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No maintenance.
Prompt deliveries.
All designs registered.
Method of fixing brackets patented.
Dual fixing of brackets is important.

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37 MINUTES SAVED

ON ONE GRINDING OPERATION BY Hicycle GRINDER

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A 3 ft. dia. motor end cover took 45 minutes to chip and file. The Hicycle Grinder does the work in 8 minutes.

Hicycle Portable Electric Tools are capable of maintaining production at a high level because :—

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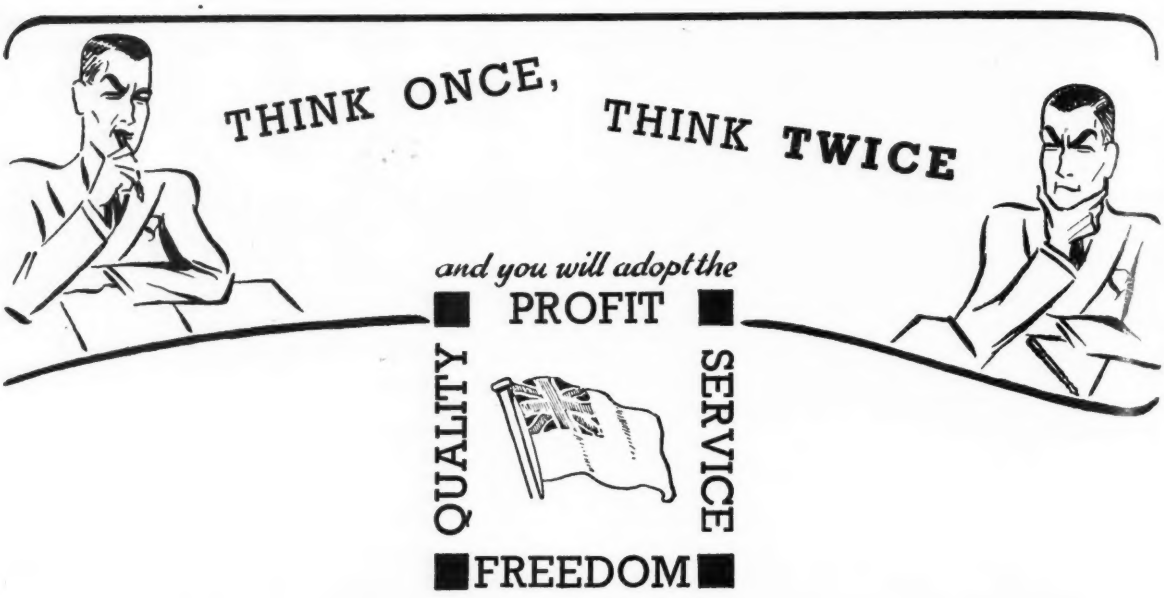

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PROFIT—Maximum profit to all distributors, plus progressive scale of discount on total sales, which is retrospective. The more you sell the more you make on ALL sales.

FREEDOM—Sell any lamps you like but don't miss the ENSIGN trade; it is getting bigger and bigger every year and 1939-40 will show a big jump.

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NOTE: For the 1939-40 season Ensign Lamps will carry out a powerful Sales Campaign that will be of immediate and direct benefit to all Distributors. Particulars will be mailed later—but make sure you are on our mailing list by dropping us a postcard.

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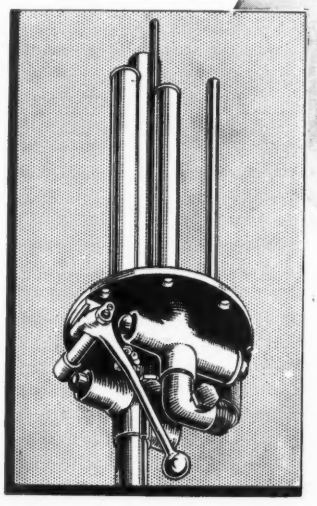


Available in
1½ gallon and 3 gallon size only to work direct on mains pressure

. . .

For full details and prices, please write to
AIDAS ELECTRIC LIMITED
SADIA WORKS ROWDELL RD.
NORTHOLT, MIDDLESEX
Phone : Waxlow 1607.

Scottish Agents : W. Brown & Co. (Eng.) Ltd., 89, Douglas Street, Glasgow, C.2.

An Electric Water Heater with

A POSITIVE ANTI-DRIP

Sadia presents a novel design of anti-drip device entirely free from gadgets.

There is nothing inside the heater which can collect fur, no syphon, no complication of tubes and the heater is not dependent on water pressure.

Both inlet and outlet are controlled by spring valves which are actuated by a single lever. This provides an

IMMEDIATE CUT OFF

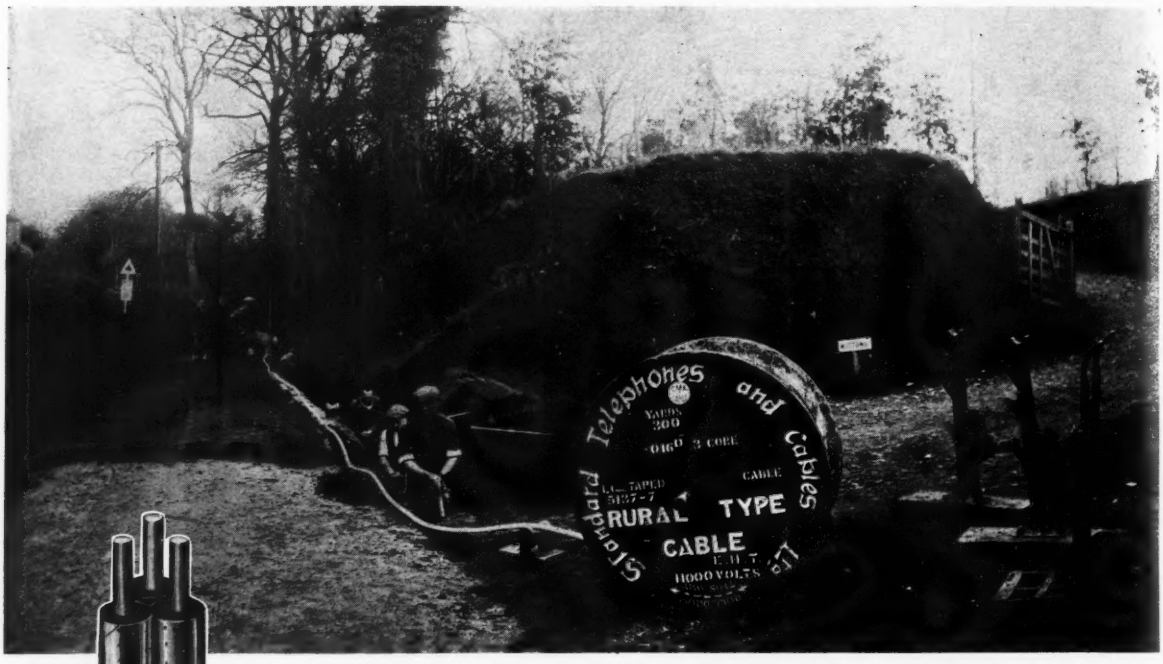
In fact, not a single drop of water is wasted, so much so that a thimble or a nut shell can be filled without over-flowing. Renewals of worn tap washers is a thing of the past and with practically no furring of the outlet tube, maintenance is reduced to a minimum.

Send for particulars or, better still, buy a sample heater and prove it to yourself. Money refunded in full if not perfectly satisfied.

THE NEW "STAR"

SADIA AUTOMATIC
ELECTRIC WATER HEATERS

RURAL TYPE CABLE



Photograph by courtesy of W. Ellis Affleck, Esq., A.M.I.E.E., M.Inst.B.E., Borough Electrical Engineer, Guildford

RURAL TYPE CABLE will frequently be found to provide a sound economic alternative to overhead line construction, over which it has the following outstanding advantages :

- Greater security of supply since it is protected from atmospheric disturbances such as lightning, snow storms, etc.
- Better voltage regulation.
- No maintenance.
- Few, if any, recurring charges for wayleave rentals.
- No interference with rural amenities.
- No danger to aircraft.

Rural type cable can be supplied for either 33 or 11 kV. working pressure and we should be pleased to supply full details and prices on application.

Standard Telephones and Cables Limited
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Clip-on HERE..

Clip-on THERE..

Clip-on almost EVERYWHERE

The Ferranti Clip-on Ammeter is indispensable for the checking of current in busbars, fuses and cables. Its simplicity permits one-hand operation with complete safety. The range of the instrument is changed by a half turn of the switch.

COMPREHENSIVE RANGES AVAILABLE :

0 – 100 – 500	0 – 7.5 – 75	0 – 20 – 100
0 – 100 – 1000	0 – 10 – 50	0 – 25 – 150
0 – 200 – 1000	0 – 15 – 75	0 – 50 – 250
0 – 300 – 1500		

Write for List IN.11.

FERRANTI

DUAL RANGE *Clip-on* AMMETER

FERRANTI Ltd., Hollinwood, LANCS.

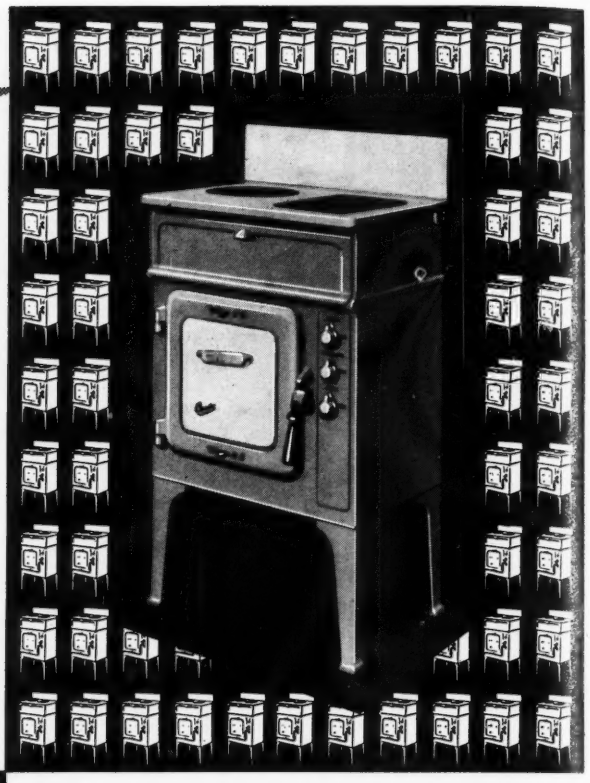
London Office : Bush House, Aldwych, W.C.2.

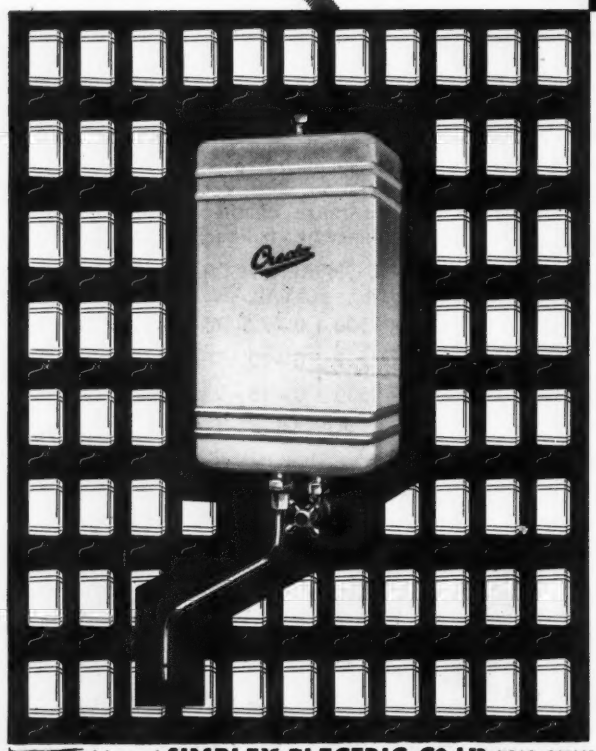
FI44

Creda

ELECTRIC

COOKERS and WATER HEATERS





for Goodwill and Good Sales

The sound construction and excellent performance of Creda Cookers and Water Heaters have won for them—and for these electric home comforts in general—a big reputation with "the man in the street." Supply Authorities appreciate the small maintenance demands when Creda Cookers and Water Heaters are installed.

Advert. of SIMPLEX ELECTRIC Co LTD HEAD OFFICE: BROADWELL Rd OLDBURY, BIRMINGHAM and Branches

SIMPLEX INSTALLATION PRODUCTS

CONDUIT | SWITCHGEAR | LIGHTING | HEATING | COOKING | WATER HEATING

Creda DOMESTIC PRODUCTS

PAPER

for high breakdown strength

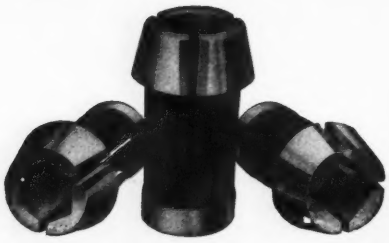
Where a small space factor combined with high breakdown strength is essential use Henley Enamelled Paper Covered and Varnished Wires (Type P.V.A.).

This type of wire is unaffected by normal impregnating varnishes and has good heat-resisting and ageing properties.

Henley Winding Wires can be supplied in all the usual finishes, Paper Covered, Enamelled, Silk or Cotton Covered, with or without compound, wax or varnish finish. May we have your enquiries?

HENLEY WINDING WIRES

Advertisement of W. T. Henley's Telegraph Works Co., Ltd. Holborn Viaduct London, E.C



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FOR CONTINENTAL AND AMERICAN CAPSTAN LATHES

SEND DIMENSIONED SKETCH OR SAMPLE WITH YOUR ENQUIRY

STANDARD, ROUND, SQUARE AND HEXAGON ALWAYS IN STOCK

REASONABLE PRICES

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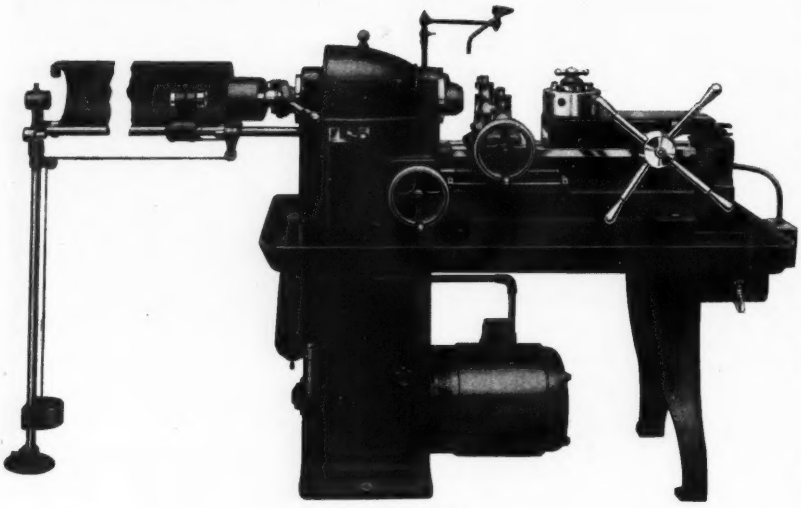
CAPSTAN LATHES

4 × ½ AND 5 × 1 1/16 IN. CENTRE DIRECT ELECTRICALLY DRIVEN CAPSTAN LATHES SPECIALLY DESIGNED FOR HIGH SPEED WORK.

ASK FOR SECTION 20K CATALOGUE.



BELT DRIVEN LATHES

WIRE FEED CAPSTAN LATHES FROM 4 TO 7 INS. CENTRES, CAPACITY ½ TO 1¾ IN. THROUGH AUTO-CHUCK.

5 × 1 1/16, 6 × ⅝ AND 7 × 1⅞ IN. CENTRE HOLLOW SPINDLE CAPSTAN LATHES.

5, 6 AND 7 IN. CENTRE SHAVING OR SECOND OPERATION LATHES.

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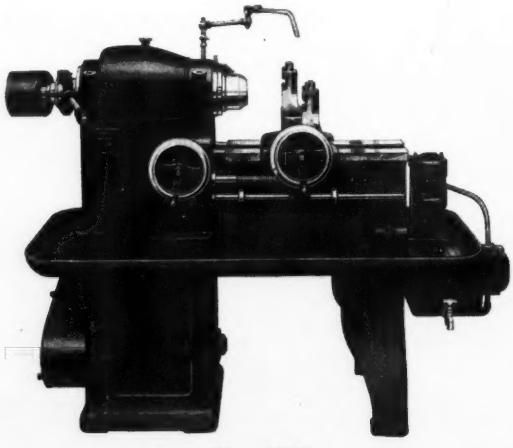
COMPLETE OUTFITS OF CAPSTAN LATHE TOOLHOLDERS MADE TO CUSTOMERS' REQUIREMENTS.

SEND PARTICULARS OF **YOUR** REQUIREMENTS AND LET US QUOTE **YOU.**

No. 1231. 5 × 1 1/16 IN. CENTRE WIRE FEED CAPSTAN LATHE WITH DIRECT ELECTRIC DRIVE, SUPPLIED WITH PLAIN CUTTING-OFF SLIDE OR TRAVERSING SADDLE AS REQUIRED.



No. 1220

7 × 1½ IN. CENTRE CUTTING-OFF, SHAVING OR SECOND OPERATION LATHE.

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CAPSTAN LATHES & TOOLHOLDERS
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ELECTRICALLY DRIVEN LATHES, SECTION 20K. BELT DRIVEN LATHES, SECTION 5K CATALOGUE

Will this be the last Tenby advertisement?

Ref: AMK.

May 11th., 1939.

Dear Sirs,

We thank you for your catalogue which we hope to make good use of.

We find that your switches advertise themselves. We should like to

"Us with our chests puffed out."

ABOVE is reproduced an entirely unsolicited testimonial sent to us by one of our customers. Not only did it make us puff out our chests with pride, but it made us realise how many thousands of pounds we have wasted in the last few years advertising unnecessarily. (So, Mr. Advertisement Manager, that's our answer when you want us to renew our advertising contract!)

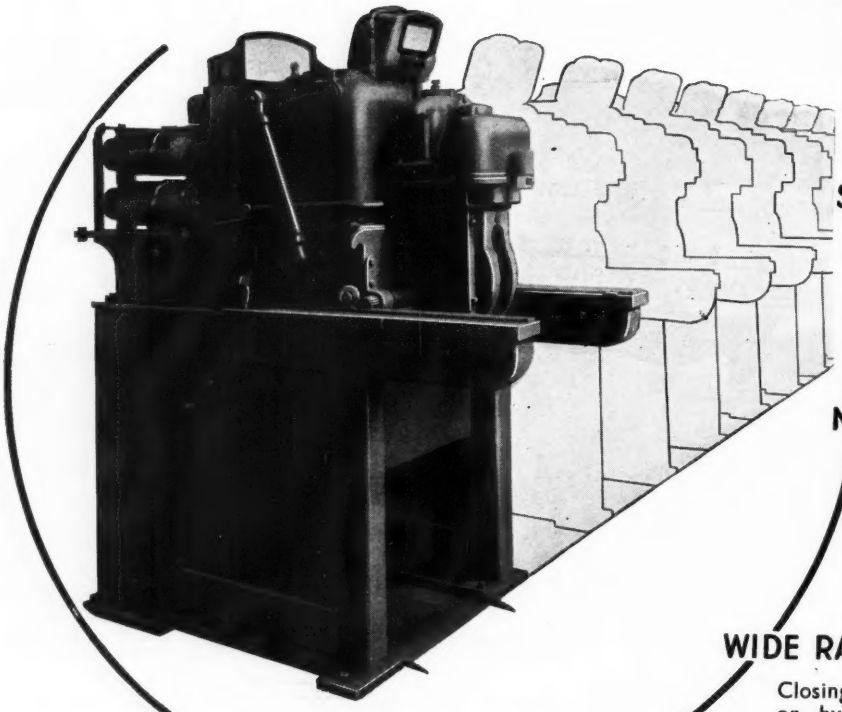
★ *This testimonial is absolutely genuine. In order to safeguard the physical well-being of the customer who sent it, we refuse to divulge either his name or address. Thereby preserving him from the clutches of an enraged Advertisement Manager.*

S. O. BOWKER LTD., TENBY WORKS, REGENT ROW, BIRMINGHAM, 1

B65

COMPOUND-FILLED
METAL-CLAD
SWITCHGEAR
K SERIES

FOR BREAKING CAPACITIES
UP TO 1,000 MVA



Type K2C, 350 MVA

ADVANCED DESIGN

backed by extensive research and long manufacturing experience.

SHORT-CIRCUIT TESTED

Consistently good performance ensured by cross-jet pots.

NEAT APPEARANCE

Wiring concealed in side frames built of welded steel.

WIDE RANGE

Closing by solenoid, by hand or by springs. Bus selection by removable plugs or oil-immersed selector switches (on or off load).

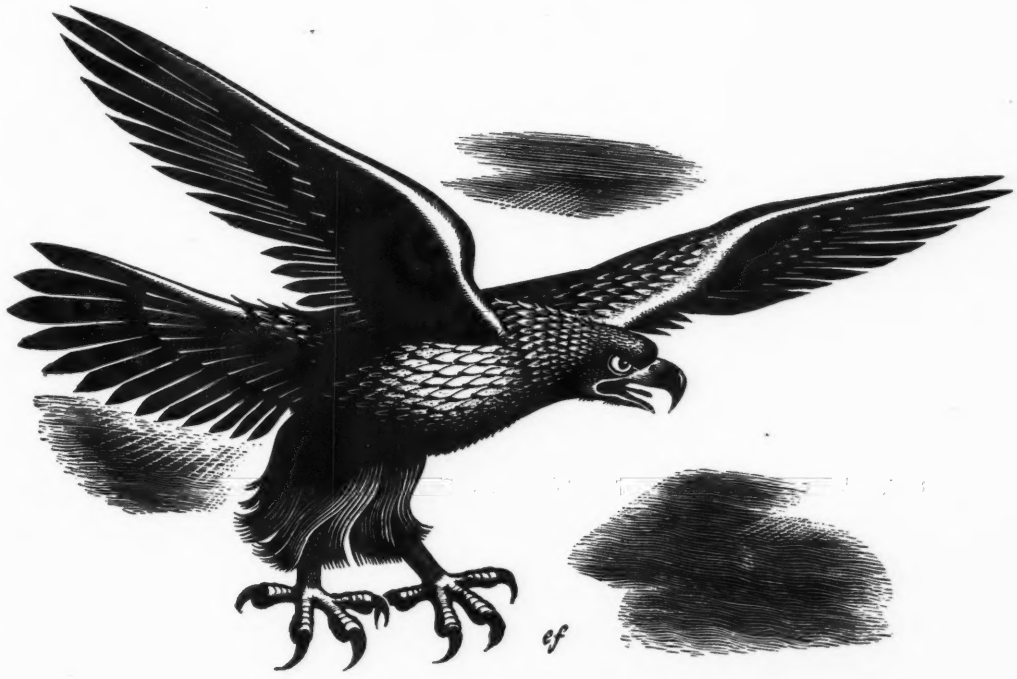
Other types for 25 to 1,500 MVA, 650 to 66,000 volts.

Send for brochure 7.7292/5 on this subject.

METROPOLITAN Vickers ELECTRICAL CO., LTD.
TRAFFORD PARK ··· MANCHESTER 17.

P/K903

'Metrovick's light' product
COSMOS LAMPS



'You cannot fly like an eagle with the wings of a wren'

W. H. Hudson

And a business cannot be built up to the stage the Alton Company has reached unless the quality of its products and the integrity of its policy are as high as its ambitions. Probably the development of the Alton Company could have been even faster—but only at a price not worth paying. The Company has never deviated from its policy of employing the most expert workmen and the finest materials; it has always quoted prices consistent with the highest possible quality, and it has won client after client purely by the excellence of its products and the reasonableness of their cost.

Two batteries of Alton Cells at Blackfriars Telephone Exchange, Manchester.

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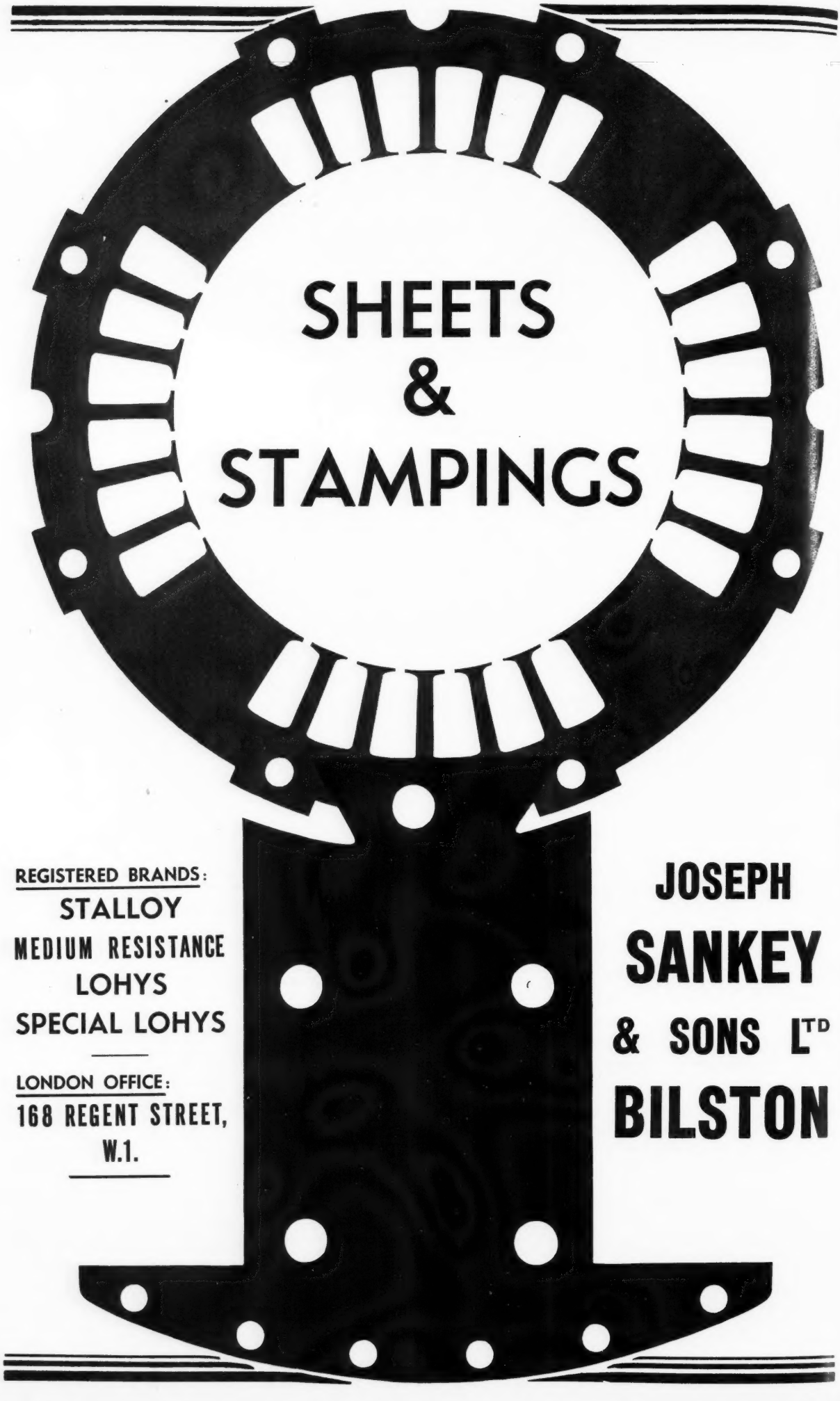
THE ALTON BATTERY COMPANY LTD

(Incorporating Fuller Accumulator Co. (1926) Ltd.)

ALTON, HANTS

Telephone: Alton 2267 and 2268 *Telegrams:* 'Battery, Alton'



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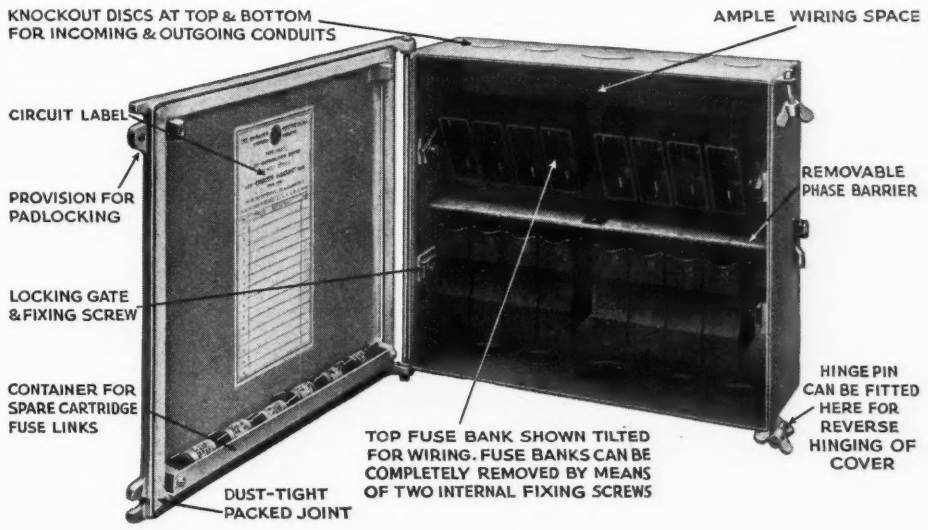
FUSEGEAR

DISTRIBUTION BOARDS

TYPE 'SS'——————250 VOLTS

For Heating and Lighting Sub-circuits.
Incorporating Type 'SS' High Rupturing Capacity
Cartridge Fuse Links.

(B.S.S. 88/1939 Categories 250 A.C.3 and D.C.3)


KNOCKOUT DISCS AT TOP & BOTTOM FOR INCOMING & OUTGOING CONDUITS
AMPLE WIRING SPACE
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REMOVABLE PHASE BARRIER
LOCKING GATE & FIXING SCREW
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HINGE PIN CAN BE FITTED HERE FOR REVERSE HINGING OF COVER
TOP FUSE BANK SHOWN TILTED FOR WIRING. FUSE BANKS CAN BE COMPLETELY REMOVED BY MEANS OF TWO INTERNAL FIXING SCREWS
DUST-TIGHT PACKED JOINT

AVAILABLE UP TO 14 WAYS—25 AMPS MAX. RATING

★ OBTAINABLE FROM STOCK

This range also includes Flush-Mounting and Combined Switch-Distribution Boards. Write for Publication No. W44 giving full particulars of all types.

DEFINITE DISCRIMINATION is obtained between Type 'SS' Cartridge Fuse Links and 'English Electric' Type 'R' Cartridge Fuse Links used in Supply Authorities' Service Boxes.

Another recent development is a range of type 'LP' 500 volts Switch-Fuse Units in ratings of 30, 60 and 100 amperes. Publication No. W45 giving all particulars will be sent on request.

COMPETITIVE IN PRICE——HIGH IN QUALITY

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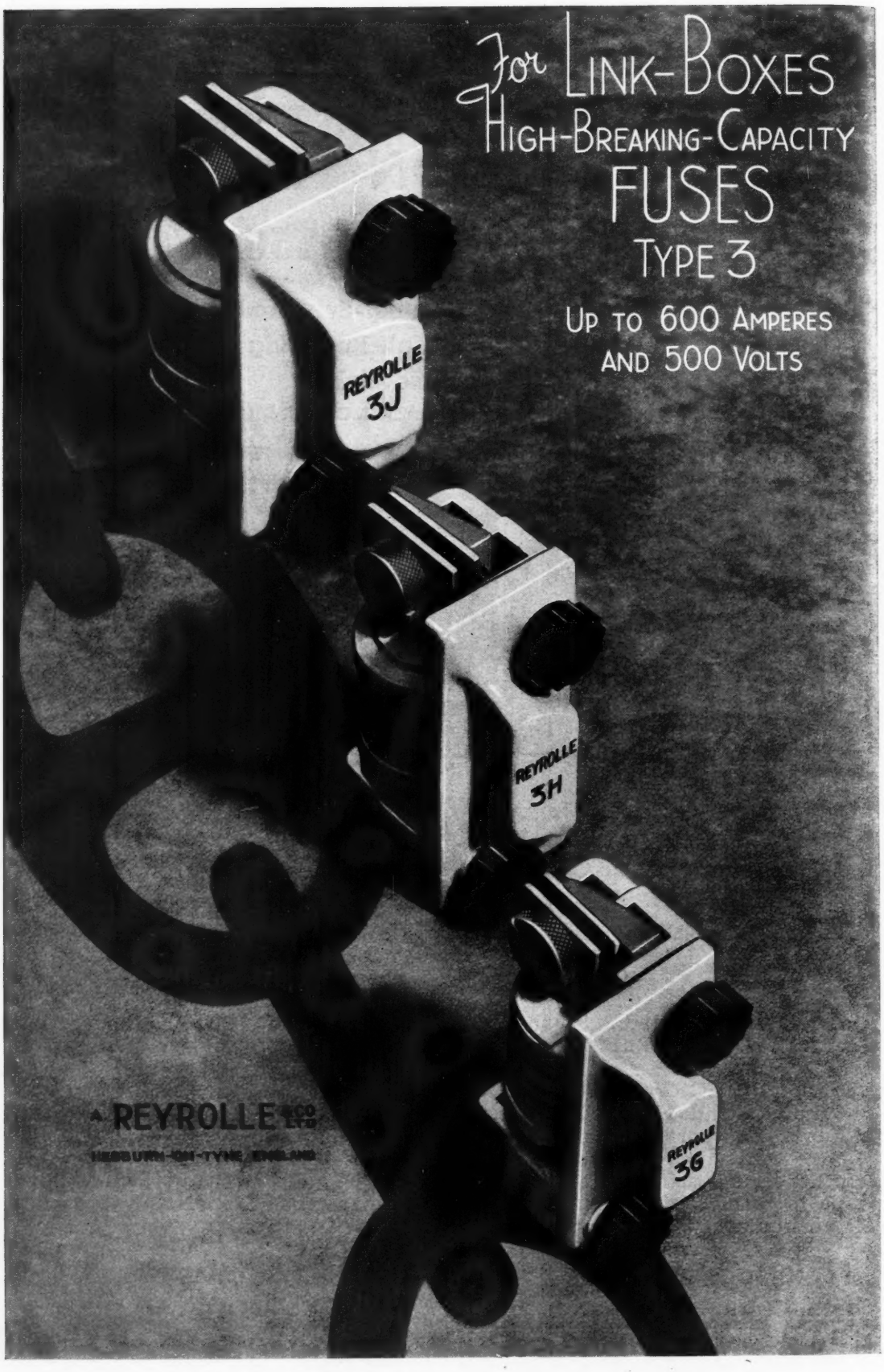
FUSEGEAR WORKS: — — — — STAFFORD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HIGH-BREAKING-CAPACITY
FUSES
TYPE 3
UP TO 600 AMPERES
AND 500 VOLTS
REYROLLE 3J
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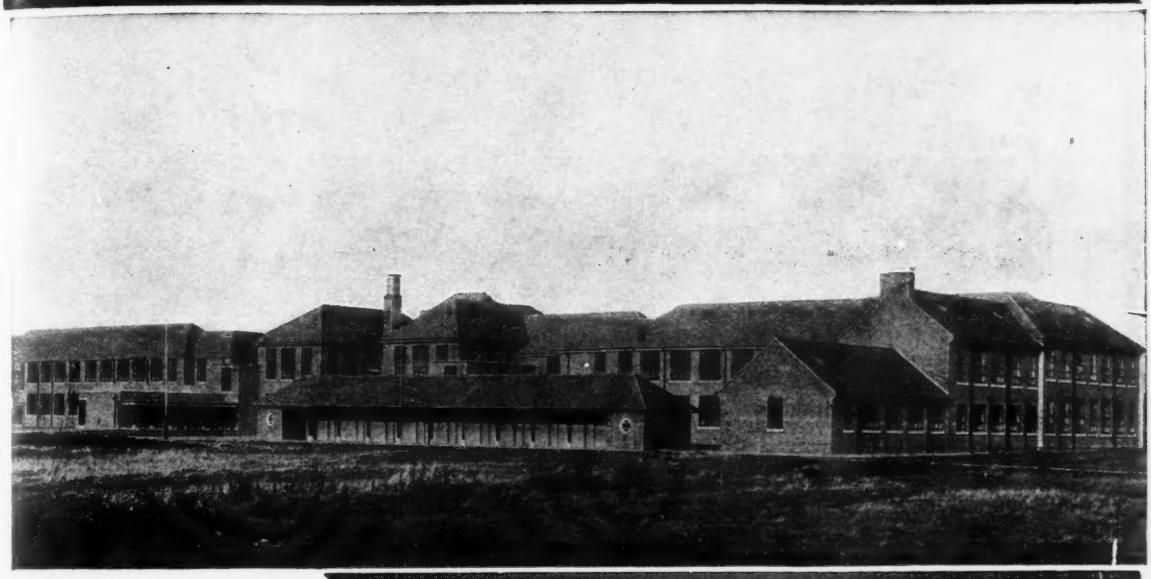
REYROLLE 3G
REYROLLE & CO. LTD.
HEBBURN-ON-TYNE, ENGLAND

Another LIVERPOOL TRADE CABLES MARK job



SOUTH WIGSTON MODERN SCHOOLS

These recently completed schools, the largest ever erected by the Leicestershire Education Committee, were wired throughout with . . . "LIVERPOOL CABLES."

by

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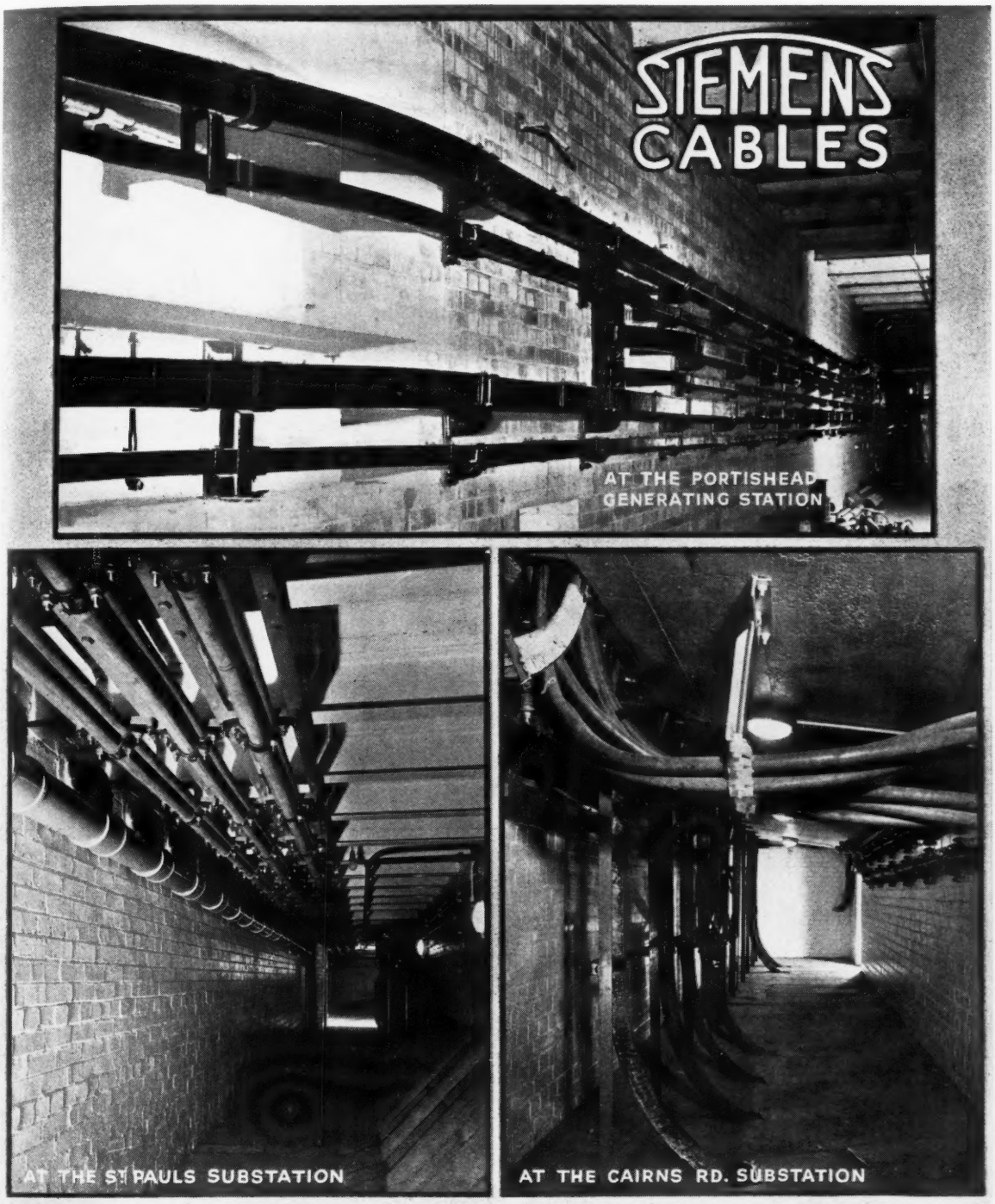
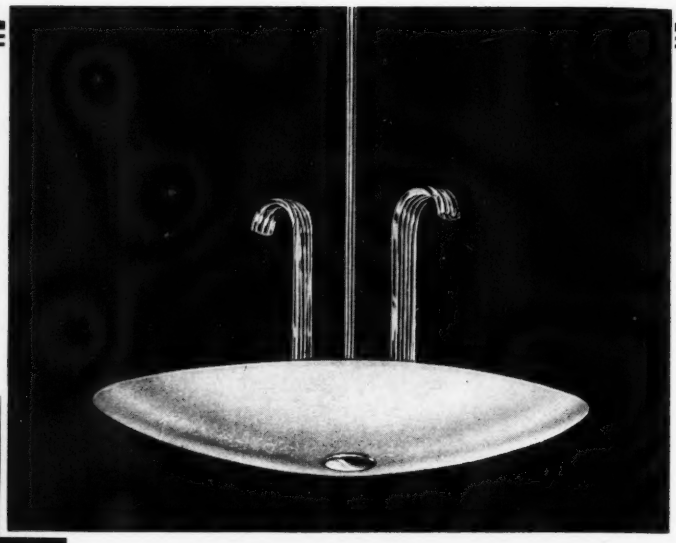
AT PRICES 25% TO 50% LOWER THAN COMPARABLE MACHINES



Installed by us
for the
BRISTOL CORPORATION ELECTRICITY DEPARTMENT

SIEMENS BROTHERS & CO., LTD., WOOLWICH, LONDON. S. E. 18
Telephone: WOOLWICH 2020

Always Select BERRY'S Fittings



Illustrated List gladly sent on request.

Berry's ELECTRIC LTD.

TOUCHBUTTON HOUSE, 85-86, Newman Street, London, W.1.
Telephone : Museum 6800 (9 lines).
Also **BIRMINGHAM and NEWCASTLE-ON-TYNE.**

ANNOUNCEMENT

The Weston Electrical Instrument Co. Ltd., Enfield, Middlesex, wish to announce that on and after 1st July, 1939, all manufacturing and trading operations in connection with Weston Electrical Instruments will be conducted by Sangamo Weston Ltd.

In effect this means that you have the united resources of two companies at your disposal for a wide range of products, with the simplicity and advantages of dealing with a single organisation which possesses the most modern research and manufacturing facilities.

All enquiries and orders for Weston Instruments should, therefore, be addressed in future to Sangamo Weston Ltd., Great Cambridge Road, Enfield, Middlesex, England.

Weston Electrical Instrument Co., Ltd.,
Enfield, Middlesex, England.

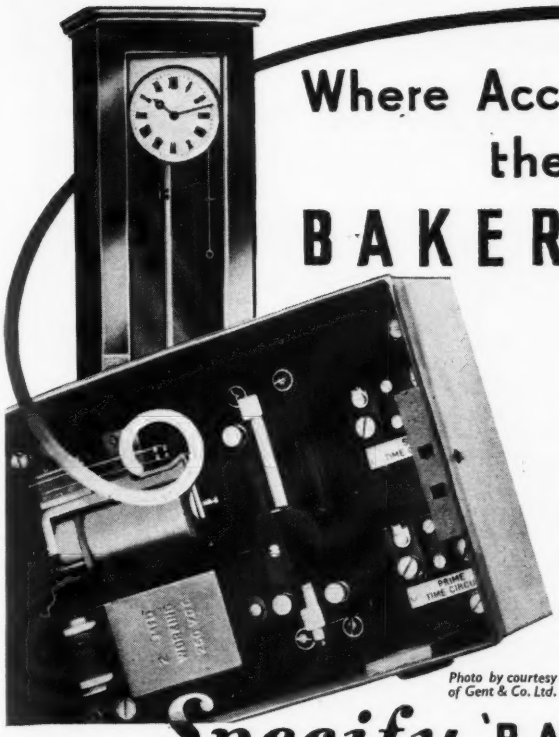


Photo by courtesy of Gent & Co. Ltd.

Where Accuracy comes First — they must be BAKER CONTACTS

Electric time-keeping systems demand precision of the highest quality. The contacts, in particular, must be extremely accurate. For instance, the contacts in this Master Clock and Sub-Transmitting Relay, manufactured by Gent & Co. Ltd., are responsible for impulsing every clock in the circuit — and there may be as many as 300. It is sufficient to say that Gent & Co. Ltd. use Baker Contacts throughout their range.

It is in the manufacture of contacts for work of this type, where consistent quality is absolutely essential, that Baker Platinum Ltd. specialise. Time and again, leading manufacturers have found that it has proved ultimately an economy to use Baker Precious Metal Contacts, to ensure long life and unfailing accuracy. We can release contacts, wire, etc., to Air Ministry A.I.D. requirements, and we are on the approved lists of the Admiralty and War Office. Our experience is at your disposal. May we prepare samples for your next enquiry ?

Specify 'BAKER CONTACTS'

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Write for booklet, "Precious Metals for the Electrical Industry."

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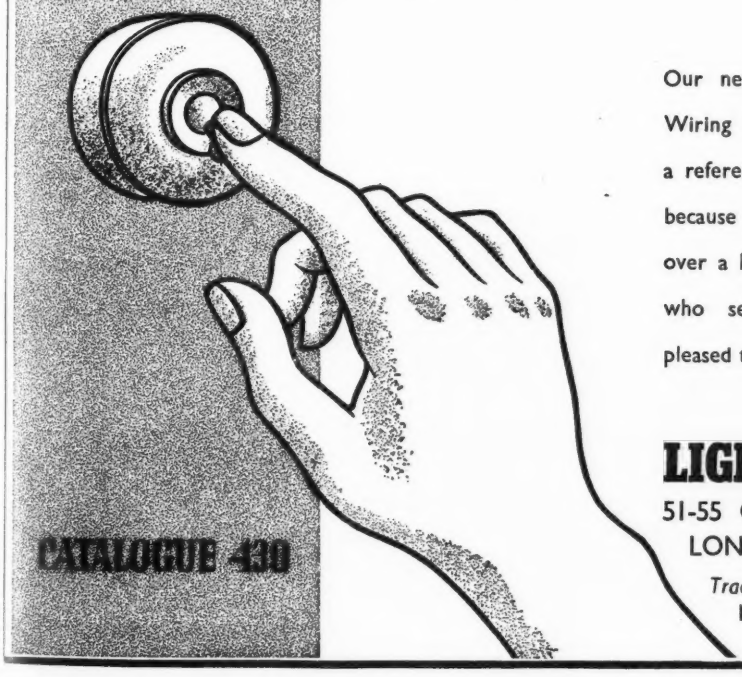
ELECTRICAL ACCESSORIES



Our new Catalogue of Electric Accessories and Wiring Supplies (No. 430) is now ready. It is a reference book which you should have handy, because of the immense variety of lines listed—over a hundred pages of useful information to all who sell electrical accessories. We shall be pleased to send you a copy on receipt of a postcard.

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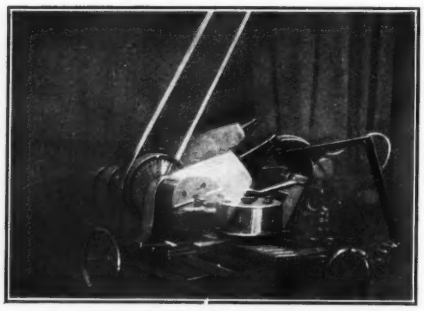
CONCENTRATE LIGHT - - - - - WHERE IT IS MOST USEFUL.



EVERY MACHINE TOOL BENCH AND DESK SHOULD HAVE ITS INDIVIDUAL

"GIRDER"

ADJUSTABLE LIGHTING FITTING

THIS METHOD OF LIGHTING AIDS THE REDUCTION OF STRAY LIGHT NECESSARY FOR **AIR RAID PRECAUTIONS** WITHOUT IMPAIRING EFFICIENCY OF OUTPUT.

These fittings are made in single, two or three link type giving 12", 24" and 36" Movements, with base for Horizontal or Vertical fixing as desired and are cheap to purchase.

DRAKE & GORHAM WHOLESALE LTD. 77, LONG ACRE, LONDON, W.C.2.

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Branches: MANCHESTER—29, Piccadilly. BRIGHTON—24, Marlborough Place. GLASGOW—88-90, York Street. BRISTOL—35, Broad Street. DUBLIN—2, Church Lane, College Green.

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MORE SECURE FASTENINGS

IN LESS TIME • • AT LOWER COST

BY THE ADOPTION OF

G.K.N-PARKER-KALON SCREWS

TYPES "Z" "A" "U"

Types Z and A are generally made with round binding counter-sunk and oval heads; type U with round heads only.

USED IN THE AIRCRAFT AND AUTOMOBILE INDUSTRIES ETC., ETC.

Tapping is eliminated—merely turn or drive Screw into plain hole. Fastenings thus made stand up better under tension stresses and withstand greater shear loads than machine screws, etc. They remain secure under severe vibration and dispense with lock washers.

We shall be glad to arrange for a representative to discuss with you how G.K.N-Parker-Kalon Screws can be adapted to your particular purpose to advantage, or we shall be glad to send you free samples for test.

BUCK & HICKMAN LTD.

WHITECHAPEL ROAD,

LONDON, E.1

Branches at BIRMINGHAM, GLASGOW, MANCHESTER

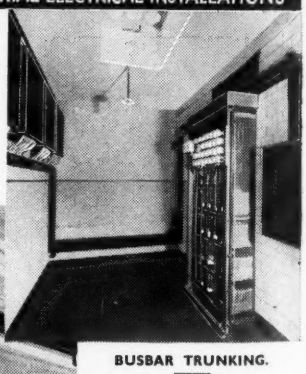
The LAST WORD IN ELECTRICAL INSTALLATION!

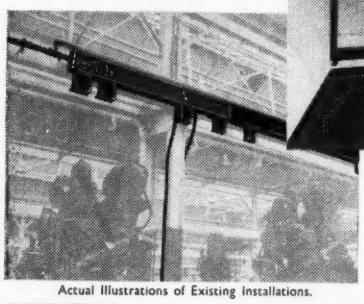
THE Patent TURRET TRUNKING SYSTEM

FOR ALL CLASSES OF INDUSTRIAL ELECTRICAL INSTALLATIONS

CABLE TRUNKING.

- ★ REPLACES MULTIPLE RUNS OF CONDUIT.
- ★ ENCLOSES ALL CABLES.
- ★ REMOVE COVERS TO ADD EXTRA CIRCUITS.
- ★ NO DRAWING THROUGH.
- ★ COMPLETE RANGE OF FITTINGS TO I.E.E. REGULATIONS.





Actual Illustrations of Existing Installations.

BUSBAR TRUNKING.

- ★ POWER AT YOUR PLEASURE.
- ★ TAP OFF FOR CIRCUITS AT ANY TIME AND IN ANY PLACE.
- ★ REPLACES ARMOURED CABLE WHERE FLEXIBILITY & EXTENSIONS ARE REQUIRED.
- ★ 3 OR 4-BAR SUPPLIED IN 200 AMP. TO 2,000 AMP. COMPLETE SCHEMES PREPARED FROM PLANS.

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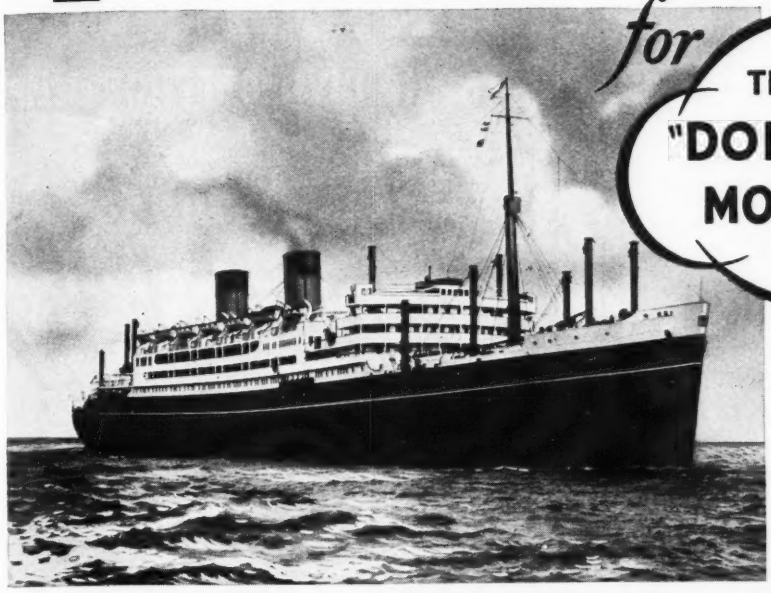

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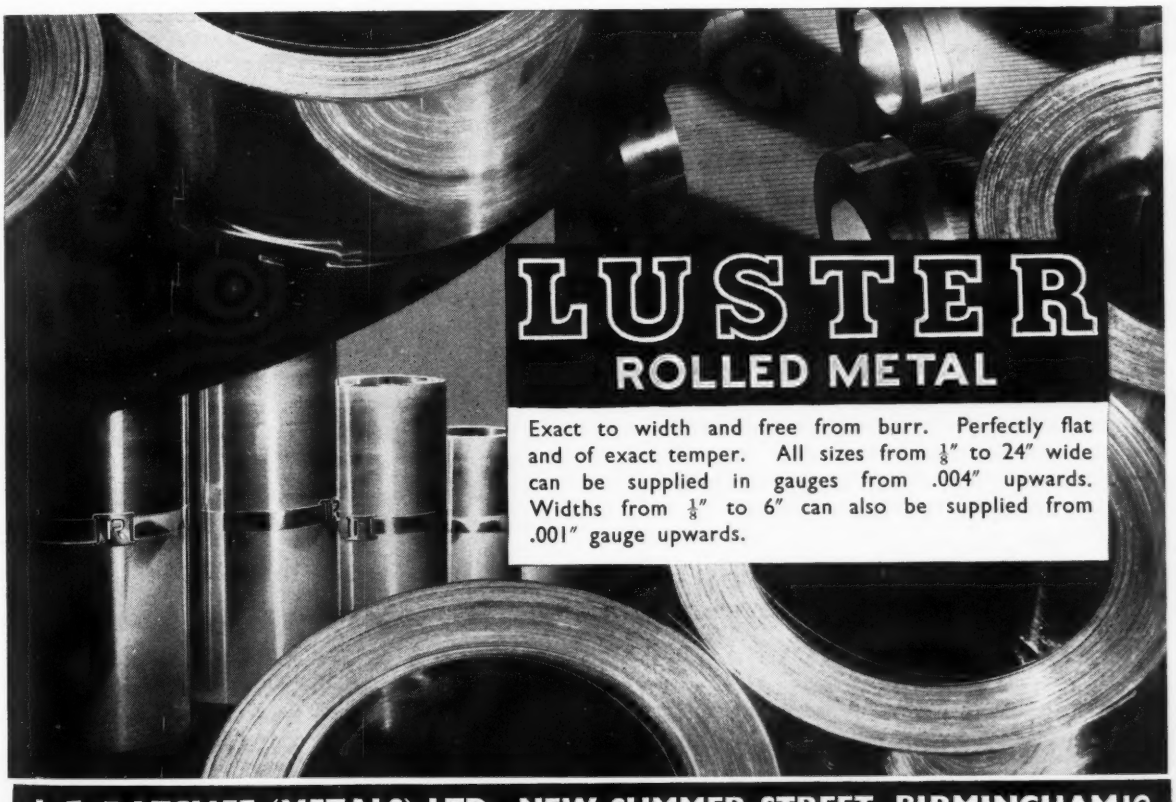
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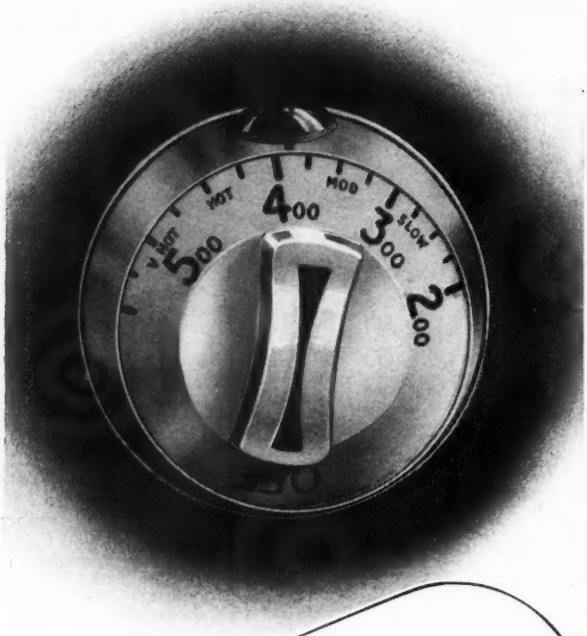

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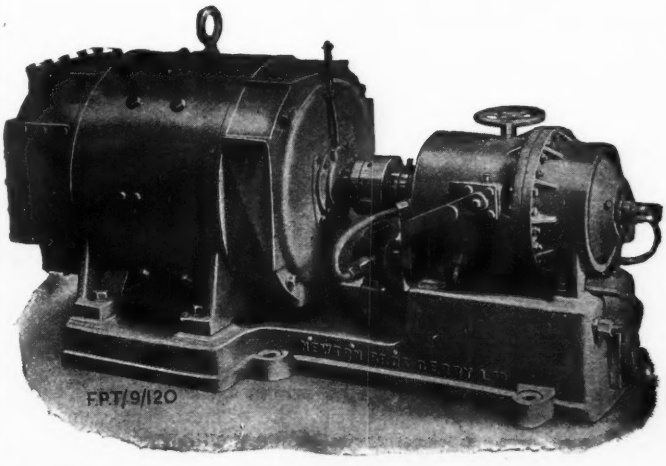

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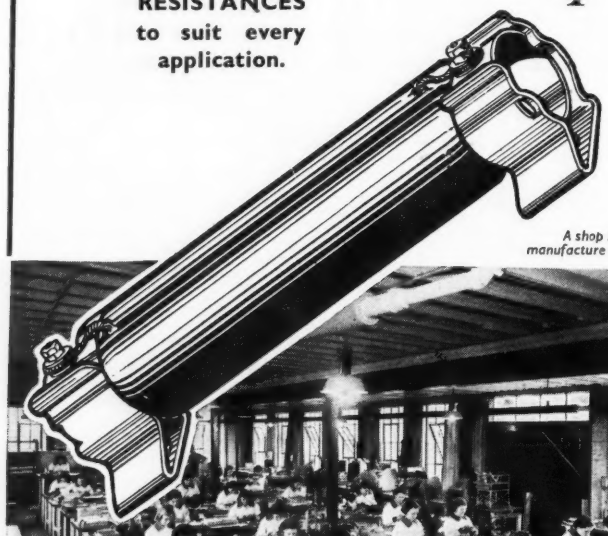

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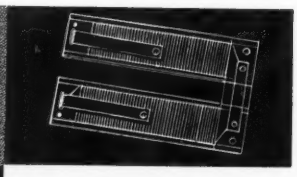

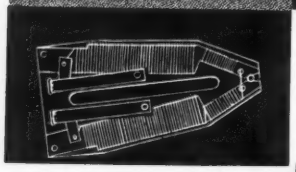

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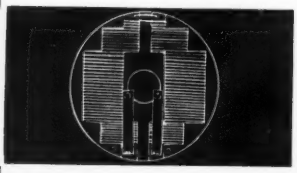

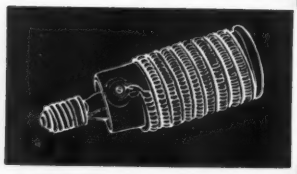

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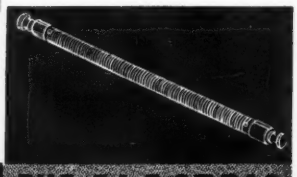

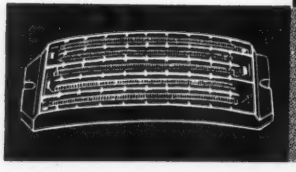

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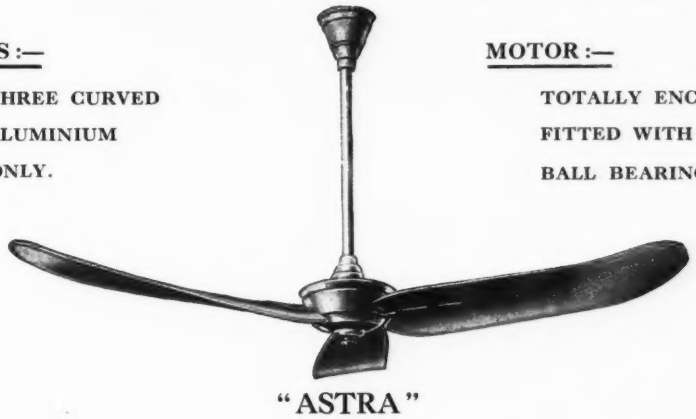

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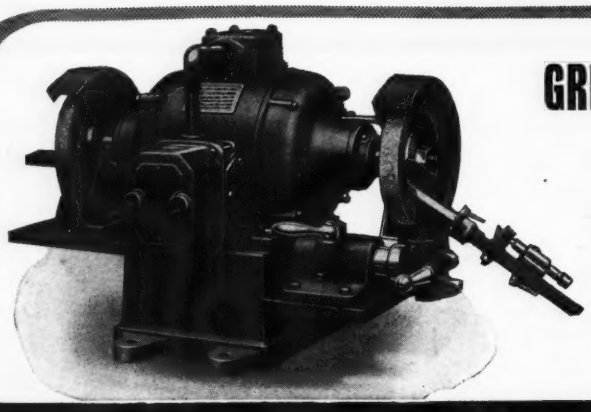

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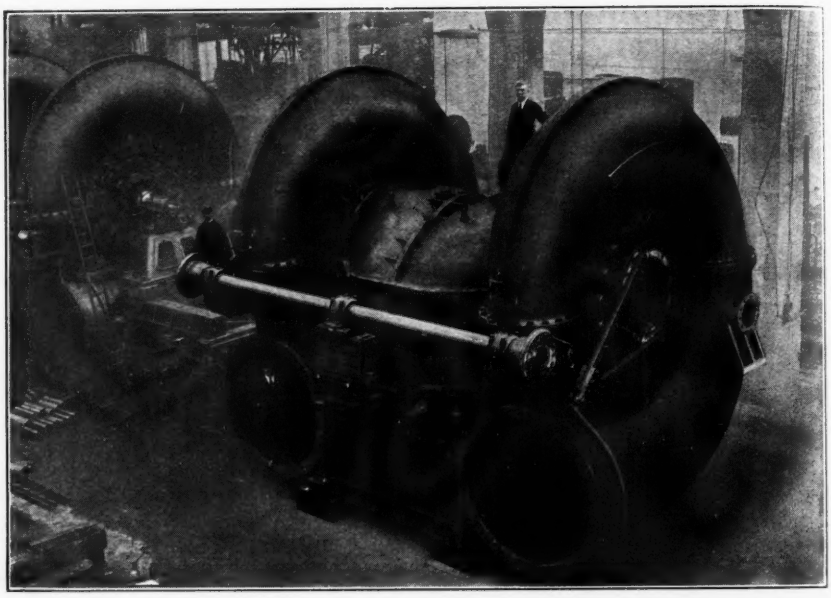

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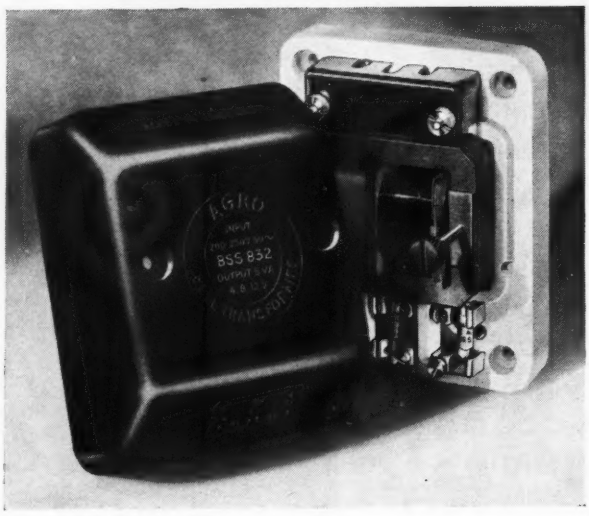

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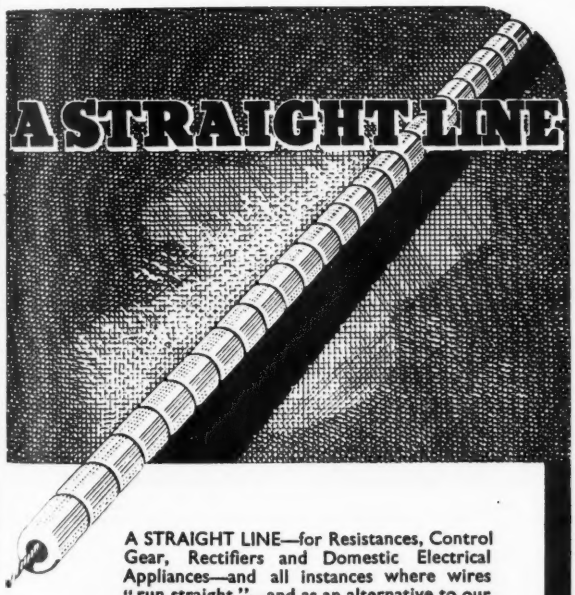

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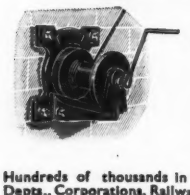

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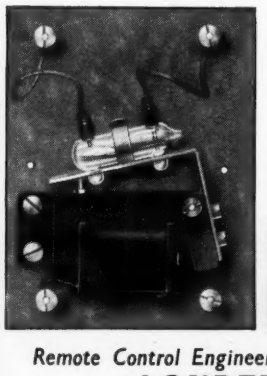

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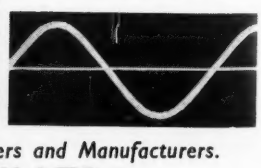

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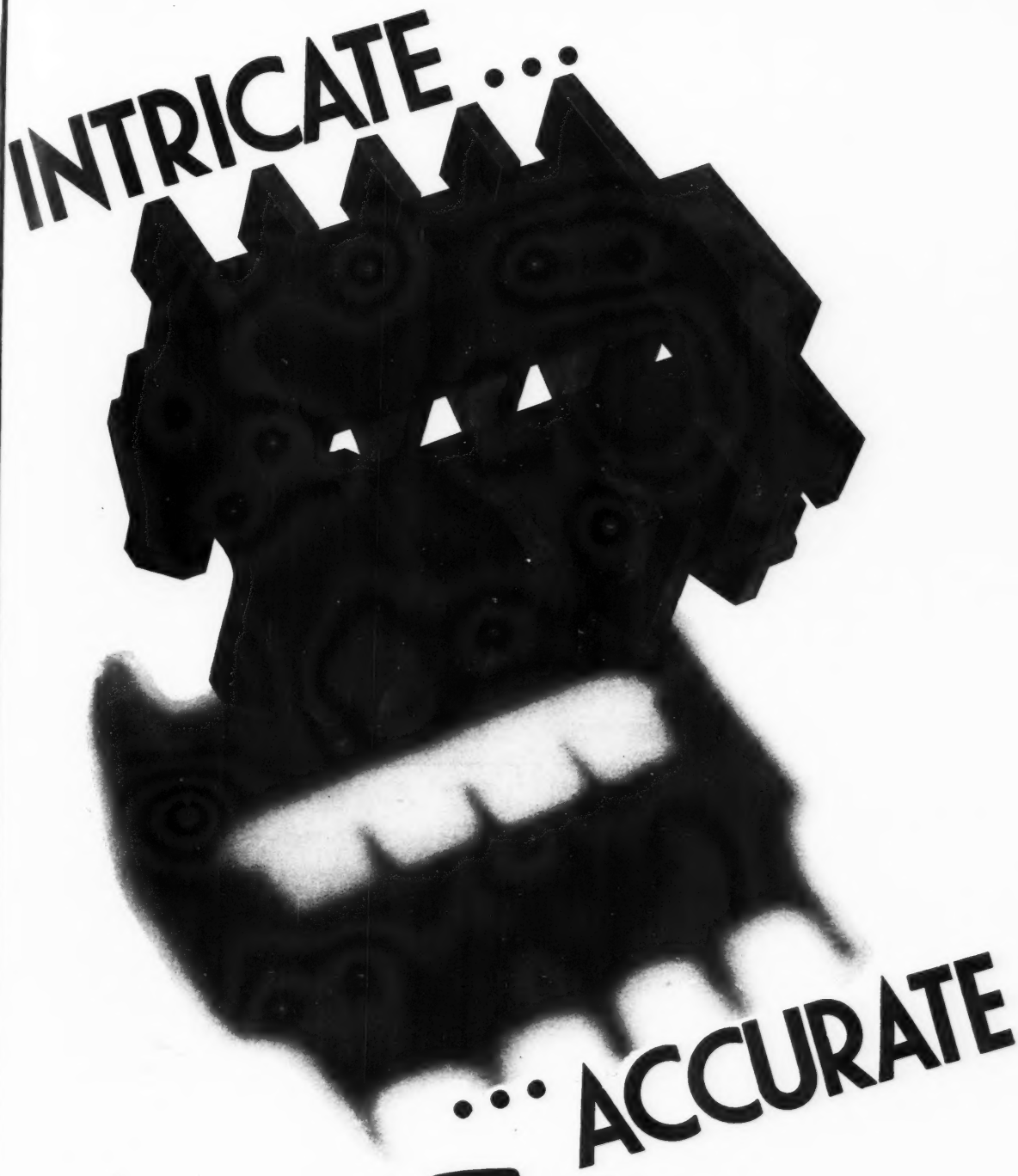

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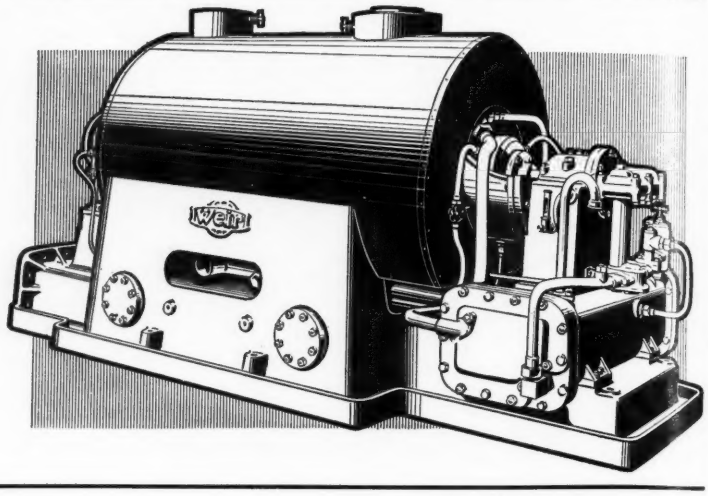

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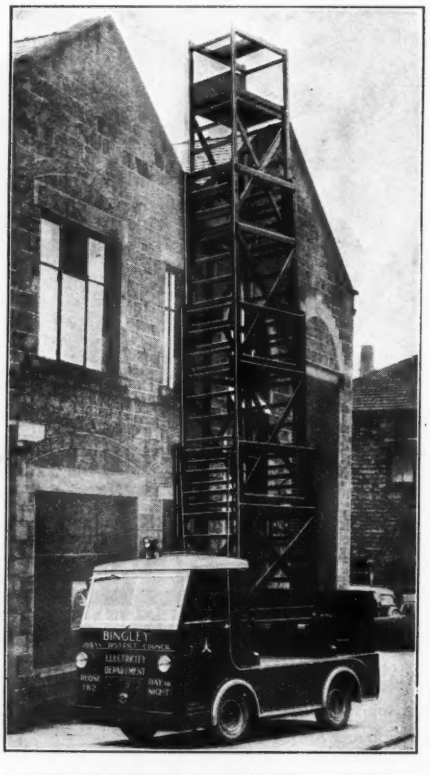

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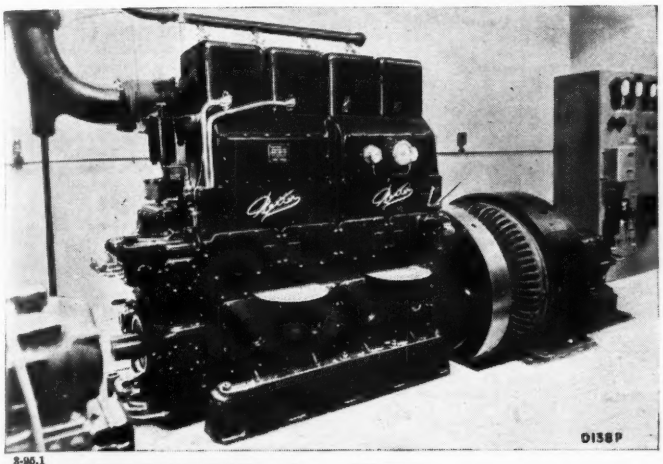

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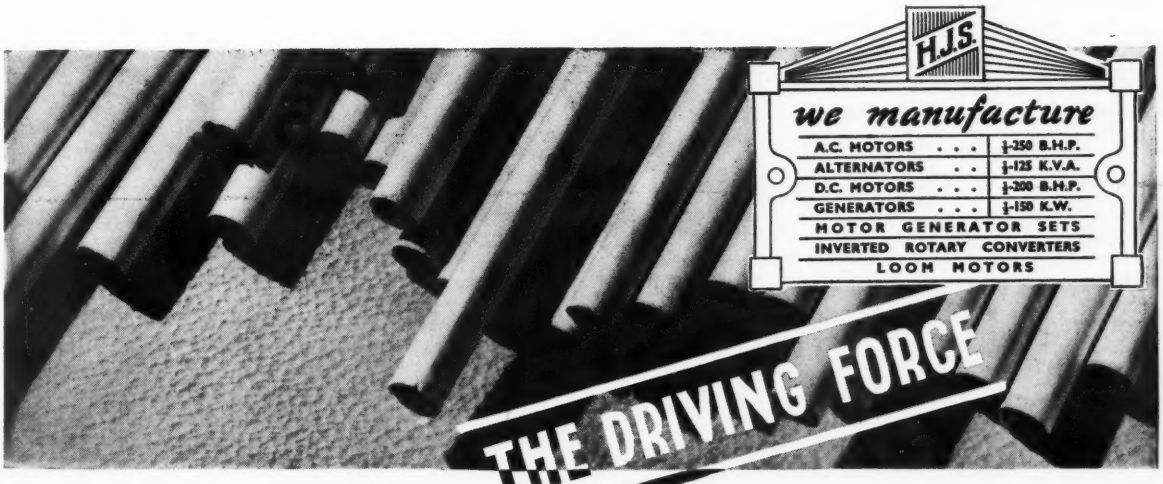

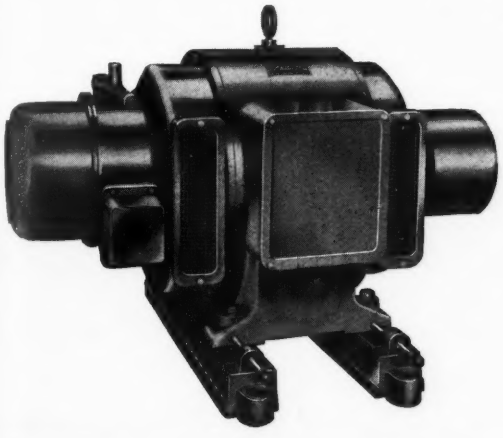

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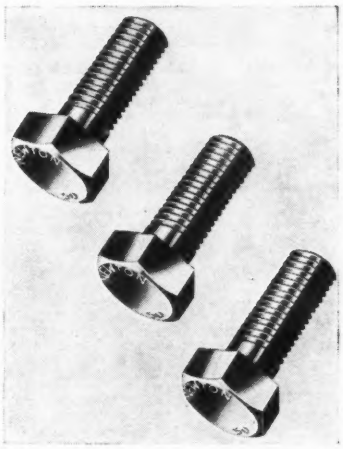

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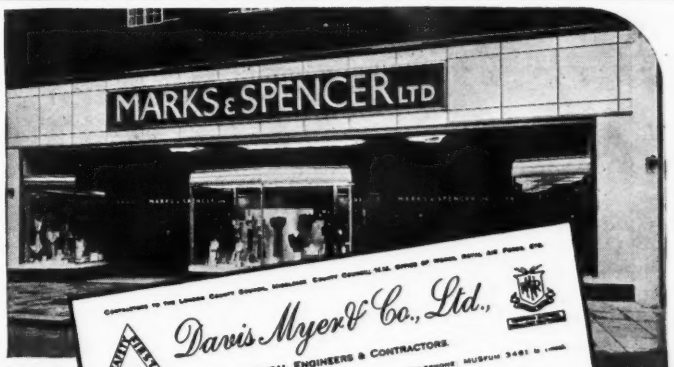

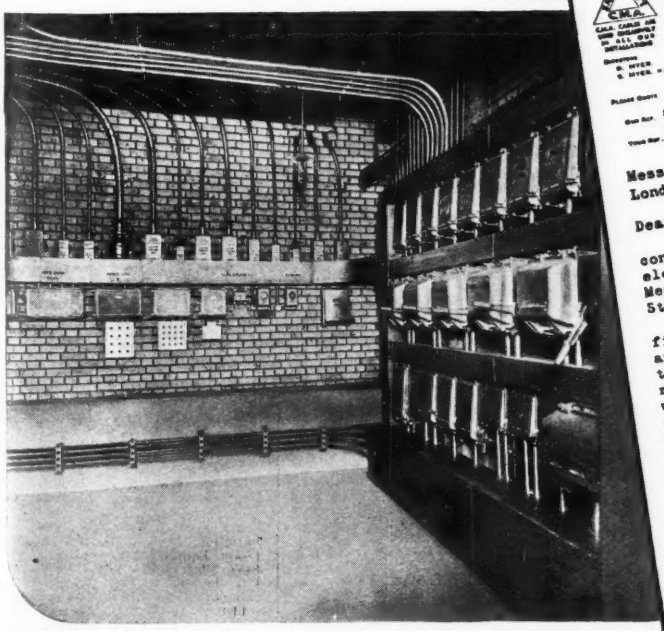

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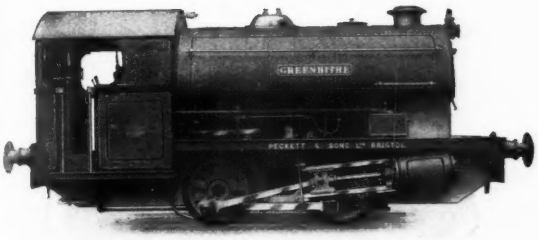

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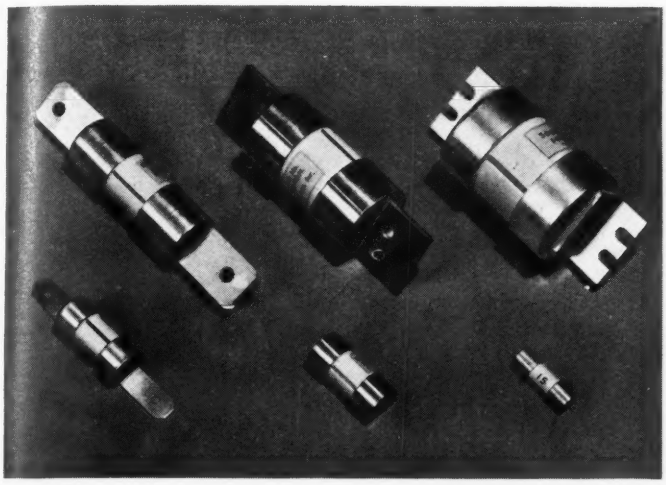

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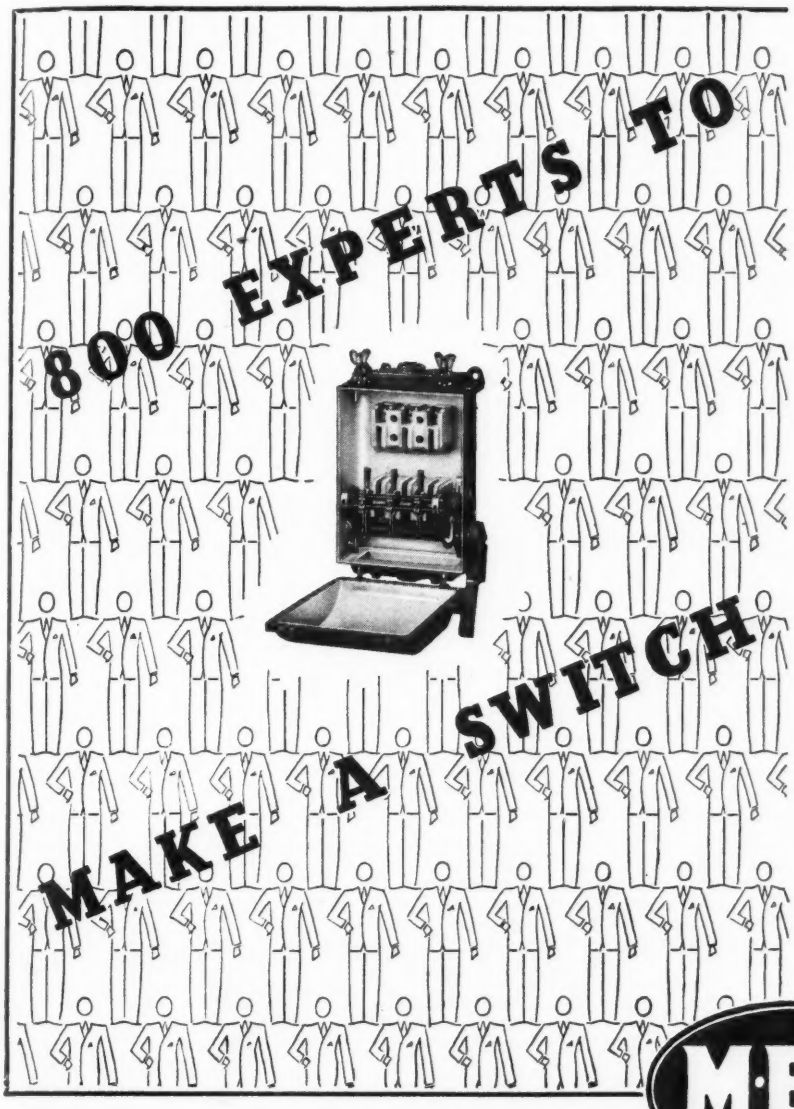

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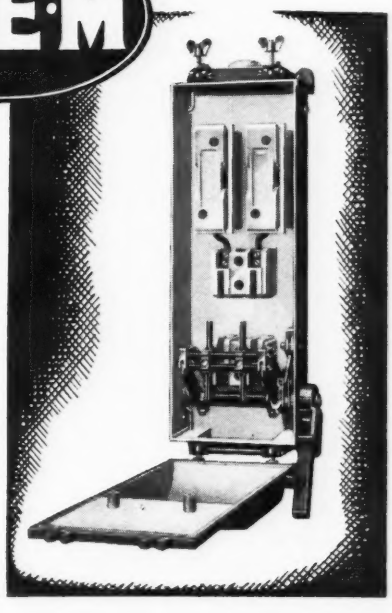

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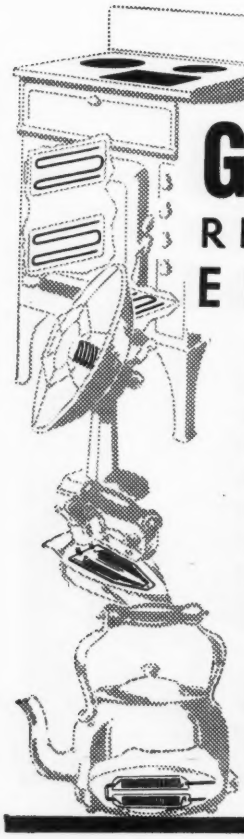

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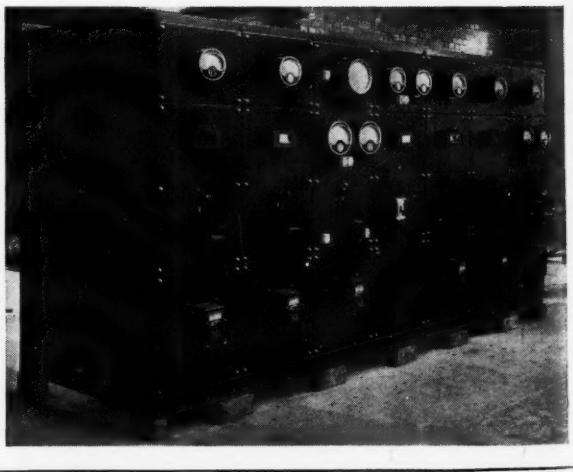

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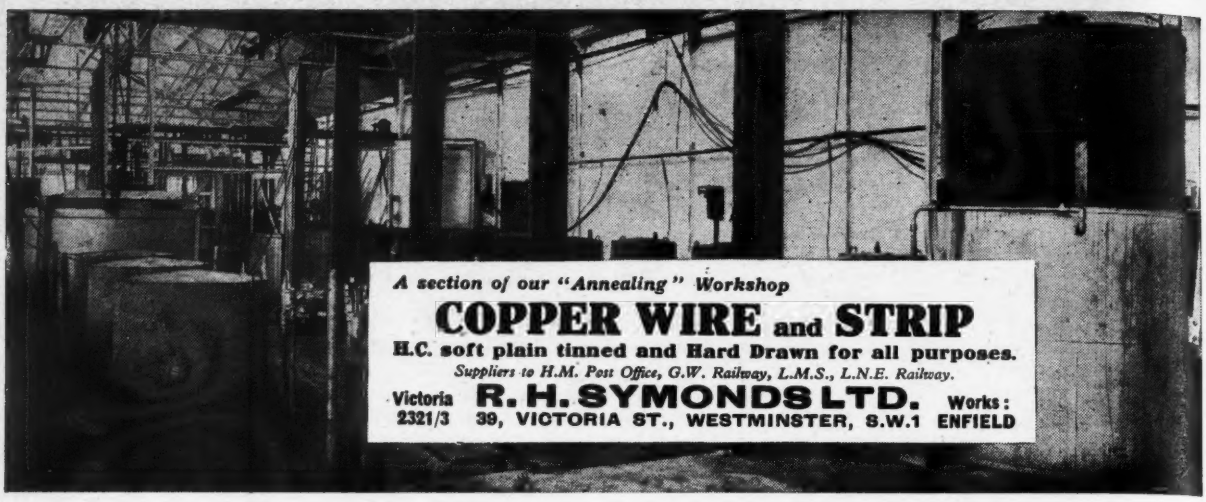

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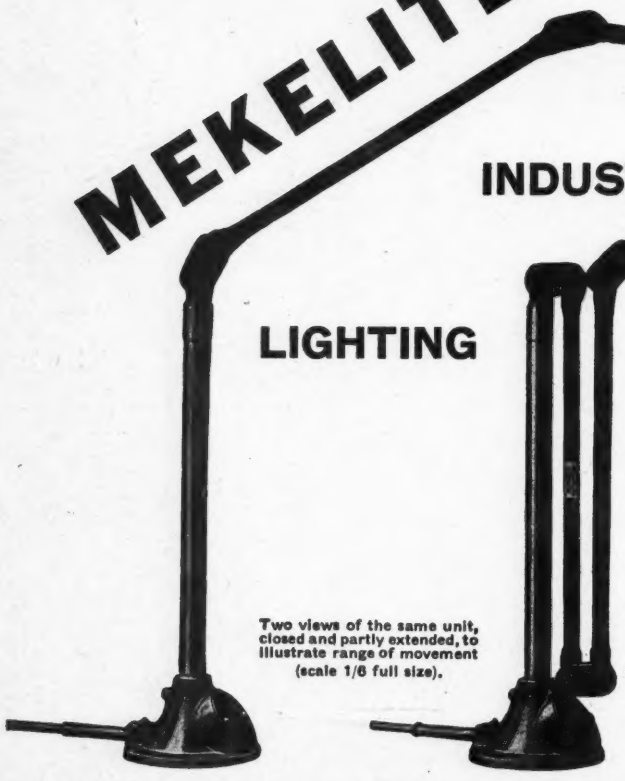

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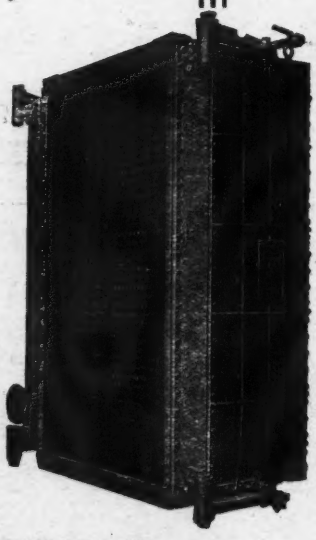

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